

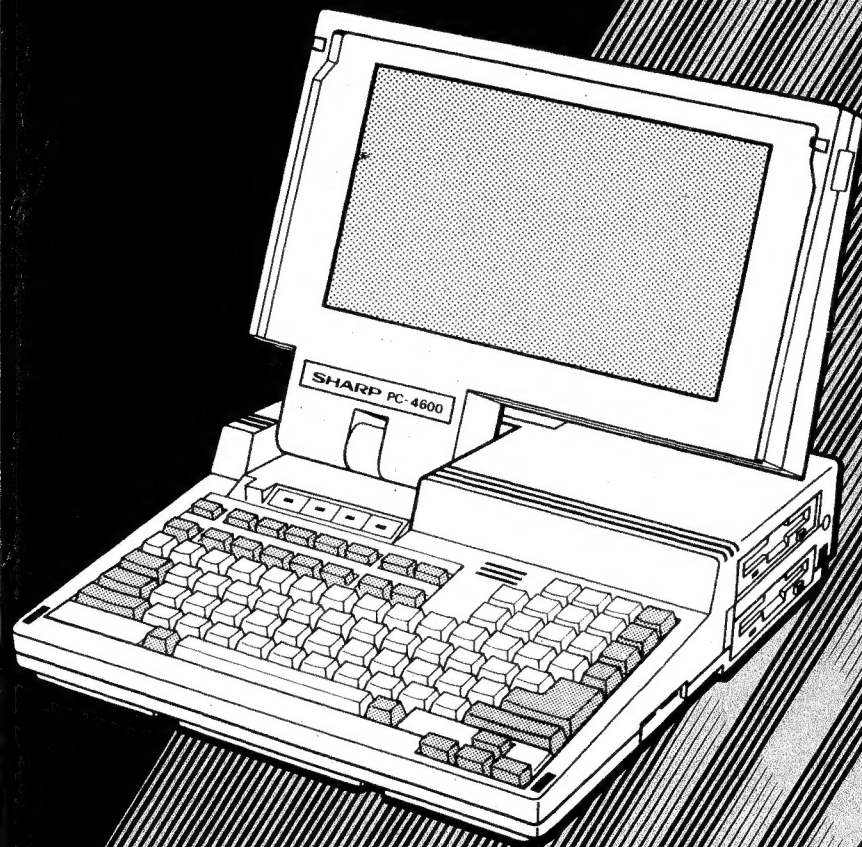
SHARP®

PERSONAL COMPUTER

PC-4602

PC-4641

OPERATION MANUAL



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For Your Records

Please record below the model number and serial number, for easy reference, in case of loss or theft. These numbers are located on the back of the unit. Space is provided for further pertinent data.

Model Number: _____

Serial Number: _____

Date of Purchase: _____

Place of Purchase: _____

OPERATION MANUAL

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NOTE

This manual is designed for both the PC-4602 and PC-4641. Unless otherwise specified, the content of the manual applies to both computers. Illustrations in the manual are based on the dual floppy PC-4602. If you are the owner of the PC-4641, please note that your computer has only one floppy disk drive. Also note that the floppy disk drive on the PC-4641 is referred to as drive A in this manual.

Welcome

If you are new to the family of Sharp products, welcome. To all new owners of this computer, congratulations. You have purchased one of the most powerful – and easy to use – personal computers available today.

By using advanced technology, we were able to pack the power of larger personal computers into this compact system. On the job or at home, you will find this to be an exceptional computer.

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Introduction

Overview

1-1

How to Use this Manual

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Overview of the System

1-7

Overview

This chapter is an introduction to the Operation Manual.

The first section describes how to use this manual and includes a summary of each chapter.

The second section is an introduction to the system.

How to Use This Manual

This manual describes the operation of the Sharp personal computer. In it, you will find all the information you need to become an accomplished user of this powerful computer.

We have designed the Operation Manual so that you can locate information quickly and easily. Each chapter begins with a title page that shows the major sections in the chapter. Titles at the top of each page help you to locate sections within chapters.

Here is an overview of what to expect in each chapter:

Chapter 1 is the introduction to the manual. It tells you how to use the manual and provides an overview of the system.

Chapter 2 describes how to set up the system as well as how to close down the system for travel.

Chapter 3 tells you how the system works together. You will see how the basic hardware and software of the computer combine to give you powerful computing capabilities.

Chapter 4 describes how to use the system to accomplish your computing needs.

Chapter 5 provides an overview of the MS-DOS* features that are used on a regular basis when operating the computer.

Chapter 6 describes the internal options – CE-451A color/monochrome CRT adaptor and CE-451B serial I/O card.

Chapter 7 describes the CE-452F external 5-1/4" floppy disk drive unit.

Appendices cover a variety of topics such as general maintenance, diagnostics, glossary and specifications.

Index helps you locate specific information quickly.

What to Read

If you plan on performing one of the tasks below, we recommend you read the corresponding chapters.

Of course, you may perform more than one of these tasks.

- ▲ Set up the system — Chapters 1 and 2
- ▲ Run an application — Chapters 1, 3, 4 and 5
- ▲ Use internal options — Chapters 1 and 6
- ▲ Use external floppy disk drive — Chapters 1 and 7
- ▲ Perform maintenance — Chapter 1 and Appendices

Documentation Conventions

Throughout this manual we have used a set of style conventions. These conventions are described below.

Keyboard Keys. When referring to specific keys on the keyboard, the key label appears in boldface as shown below.

Example:

Press **Enter** to end the command.

Sample Screens. This manual contains sample screens. These samples include prompts (text generated by the system) and entries that you type on the keyboard.

As shown below, prompts are shown in normal type and your entries are shaded.

```
A>DIR A:
```

```
Volume in drive A has no label  
Directory of A:\
```

```
SALESREP  DOC   104960   11-11-87   12:00a  
MEMO      DOC    3072    11-11-87    9:15a  
2 File(s) 611968 bytes free
```

```
A>
```


Command Names. When referring to MS-DOS* commands, the command name is written in uppercase as shown below.

Example:

Use COPY to move the file from one disk to another.

Notes. Notes are used to give you helpful hints or suggestions on ways of doing certain operations.

Cautions. Cautions are used to alert you that damage to the equipment or loss of data might occur if certain procedures are not followed carefully.

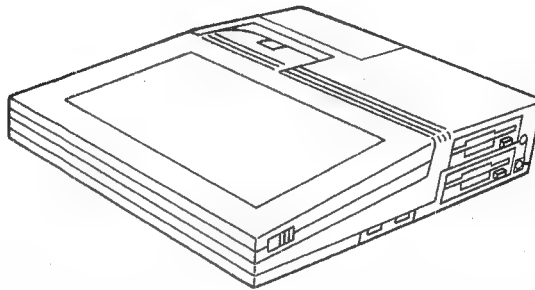
Warnings. Warnings are used to warn you that bodily injury might occur if precautions are not taken. Warnings always appear in *italic*.

Overview of the System

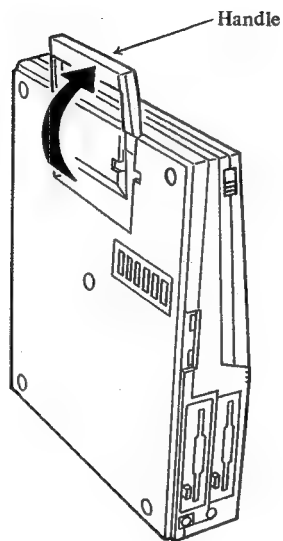
Your system is made up of hardware and software. Let's begin with the hardware.

The Hardware

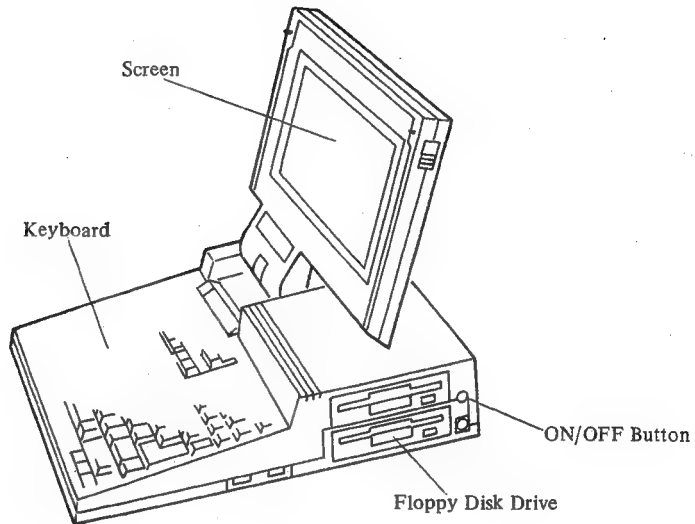
Simply put, hardware is equipment. It is the physical part of the computer system that you can touch. The illustration below shows you what the standard hardware looks like when the system is closed.



As you can see, the entire system can be carried by the handle.



Here's how the standard hardware looks when the system is set up.



Let's look at each piece.

The Main Unit. The main unit houses the keyboard, screen, two (PC-4602) or one (PC-4641) floppy disk drive(s), one hard disk drive (PC-4641), one parallel I/O (input/output) port, one serial I/O port, one port for the external floppy disk drive unit, and internal hardware needed to run your computer. All other hardware is connected to the main unit.

Let's begin with the internal hardware.

The system board in the main unit houses the processor, main memory, and the clock. It also contains hardware that controls the screen and keyboard. In addition to the system board, the computer can be configured with option cards to expand its capabilities.

The processor is the "brain" of the computer. It processes data — or information — at speeds so fast its performance is measured in millionths of a second.

This is because a processor handles information in binary code using the digit 0 or 1. Any piece of information (e.g., a number or character) is represented by a string of 0's and 1's. For example, the number 23 in binary is 10111.

A 0 or 1 in a binary system is referred to as a bit, the smallest piece of information handled by the processor. A byte is a group of bits representing a single character or number such as "H" or "9".

The standard processor for this computer is an 80188 compatible processor.

Main memory, usually referred to as RAM (Random Access Memory), stores data and applications software for the processor.

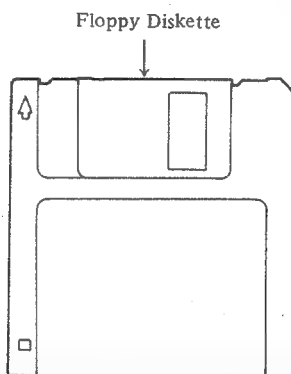
RAM is measured by the amount of information (bytes) it can store. A symbol often used for this measurement is "K". One K represents 1024 bytes.

The standard system guarantees 640K of usable memory.

Also inside the system is a clock that keeps track of the date and time, even when the system's power is turned off, and a speaker that provides audio feedback during certain operations.

Let's move on to the remaining system hardware — the disk drive, the screen, and the I/O ports.

Floppy Disk Drive. The computer contains two (PC-4602) or one (PC-4641) floppy disk drive(s) for storage and retrieval of information. Floppy diskettes like the one shown below can store up to 720K of information.



Hard Disk Drive. The computer (PC-4641 only) contains a hard disk drive which can store up to 40 megabytes of information. One megabyte (M byte) represents 1024K.

Screen. The screen acts as a window where the processor sends information for you to view. Information typed at the keyboard, read from a floppy diskette or hard disk, or sent via a modem, etc. is displayed here.

Text and graphics are displayed on the illuminated crystal display with 640 pixels horizontally \times 400 pixels vertically in the following manners:

Text: The computer displays 80 characters \times 25 lines.

1 character consists of 8×16 pixels.

Graphics: For 640×200 graphics, one pixel is displayed vertically expanded to two pixels (double scanned). For 320×200 graphics, one pixel is displayed vertically and horizontally expanded to four pixels (2×2 pixels). By changing the number of illuminated pixels among the four pixels, four levels of gray are emulated to represent four possible colors.

I/O Ports. The computer has three I/O (input/output) ports for connecting external devices to the system — a parallel port, used to connect a parallel printer, a serial port, used for communications, and a port for connecting an external 5-1/4 inch floppy disk drive unit.

Keyboard. You communicate with the main unit by typing at the keyboard. Many of the keys work just like those on a regular typewriter. However, as you will see, some of the keys have special functions not available on a typewriter.

Hardware Options

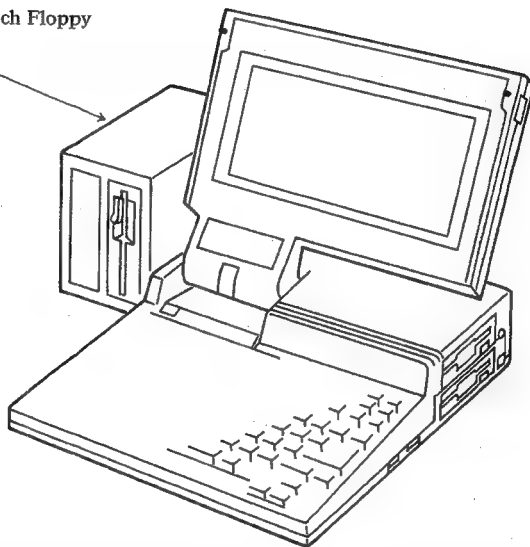
The hardware described above comprises the standard system. The following hardware options can be used with the standard system to expand capabilities:

- ▲ External 5-1/4 inch Floppy Disk Drive Unit
- ▲ 8087 Co-processor
- ▲ ROM Disk Card
- ▲ EMS Memory Card (Version 3.2)
- ▲ Color/Monochrome CRT Adaptor
- ▲ Serial I/O Card

Note: Only one of the ROM disk card, EMS memory card or the CRT adaptor can be installed in the computer at a time.

External 5-1/4 inch Floppy Disk Drive Unit. The computer has one port for connecting a 5-1/4 inch floppy disk drive to the system. You can easily connect the drive unit CE-452F to the system.

CE-452F 5-1/4 inch Floppy
Disk Drive Unit



8087 Co-processor. For improved processing performance, an 8087 co-processor can be added to the system.

ROM Disk Card. The CE-452B ROM disk card can be customized to store software programs for easy execution. For details, contact your Sharp dealer.

EMS Memory Card. The CE-453B EMS memory card is a 1M byte memory card which conforms to the Lotus*/Intel*/Microsoft* expanded memory specifications.

Color/Monochrome CRT Adaptor. A color or monochrome CRT (short for Cathode Ray Tube) can be used in addition to the standard screen. In order to use a CRT, the CE-451A color/monochrome CRT adaptor must be installed in the main unit.

Serial I/O Card. By installing the CE-451B serial I/O card, the computer has two serial ports to communicate with external devices such as a serial printer, external modem, and mouse pointing device.

The Software

In order to use computer hardware for tasks like writing memos or balancing a checking account, software is required.

Software is a series of instructions that direct the computer to perform specific tasks. It is generally loaded into main memory from a floppy diskette where it remains until the system is turned off or other software is loaded.

Software (sometimes referred to as programs) can be divided into three categories — operating system software, programming languages, and applications software.

Operating System Software. Operating system software manages the computer's resources such as disk drives and printers. By performing these general routines, operating system software forms the base on which applications software can run.

The operating system software for this computer is MS-DOS*, version 3.3. The diskette packaged with the computer contains this software.

Programming Languages. You can write programs using various languages. The computer provides GW-BASIC* version 3.2 as its standard programming language.

Applications Software. Applications software helps you perform business and personal tasks such as word processing, spreadsheet analysis, and graphics presentations.

Many of the applications written to run with MS-DOS* can be used on this computer.

Set Up and Close Down

Overview

2-1

Picking a Location

2-3

Keytop Replacement

2-5

Setting Up

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Closing Down

2-21

Overview

This chapter describes how to set up and close down the standard system.

The first section shows you how to pick the right location for setting up the system.

The second section describes how to replace keytops.

The third section provides instructions on how to set up the system.

The fourth section describes how to close the system for transportation.

If you are setting up any of the options such as the color/monochrome CRT adaptor, turn to the appropriate chapter for installation instructions once the standard system is set up.

Picking a Location

You will want to begin setting up your system by picking the right location for its use. While this computer is small enough to be used almost anywhere, certain guidelines should be followed so that you can operate the system comfortably and safely.

Environmental Requirements

Surface. Pick a hard, flat surface on which to set up and operate the system. Using the system on a bed or rug restricts the air circulation and could result in static electricity affecting the performance of the system.

A table or desk with room to spread out materials such as manuals, diskettes, and papers is the best choice. If you are using a printer with the system, be sure you have enough room for this piece of equipment as well.

Temperature. This computer does not require any external cooling system such as air conditioning in a normal environment. However, do not operate the system in extreme temperatures below 10 degrees C (50 degrees F) or above 35 degrees C (95 degrees F).

Humidity. Like any electrical device, the computer can be damaged by extreme moisture or humidity. Do not operate the system in humidity above 80 percent.

Lighting. The computer's illuminated crystal display provides easy viewing even in relatively low light.

Electrical Requirements

The following electrical requirements must be considered when picking a spot for the computer.

Power Supply. This computer is powered by a built-in lead battery. The lead battery is recharged by using the AC adaptor. It is fully charged in approximately 8 hours when the computer is turned off. The fully charged battery allows the computer to run for approximately 4 hours (PC-4602) or 2.5 hours (PC-4641) when the disk drive is used at the rate of 10 percent and the backlight brightness is half.

After the above-mentioned period of time, the computer is automatically turned off.

Interference. It is possible that radio and television interference can occur when running the system, even if the equipment is installed properly. Therefore, use the equipment away from radios and televisions.

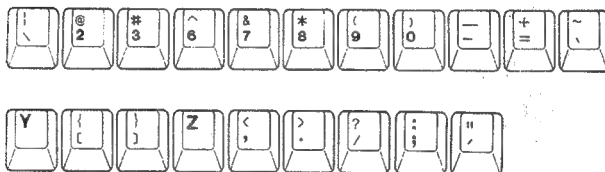
Keytop Replacement

The standard system for Europe except United Kingdom usually has a German keyboard. Using five sets of optional keytop kits, you can change your keyboard to the European English, French, Italian, Swiss, Danish, Norwegian, Swedish, Finnish, or Spanish Keyboard.

If your computer already has your own keyboard, skip this section.

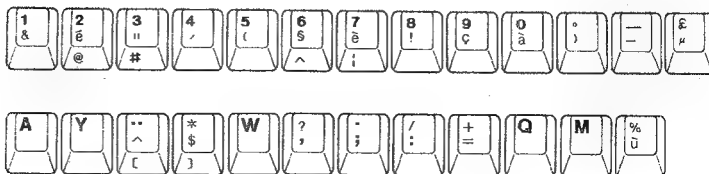
CE-460KE English keytop kit (20 keytops)

- For European English keyboard



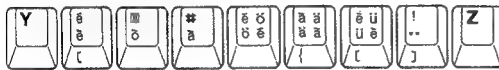
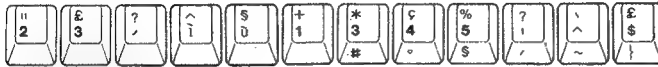
CE-460KF French keytop kit (25 keytops)

- For French keyboard



CE-460KW Italian/Swiss keytop kit (21 keytops)

- For Italian/Swiss keyboard

**CE-460KS Scandinavian keytop kit (26 keytops)**

- For Danish/Norwegian/Swedish/Finnish keyboard

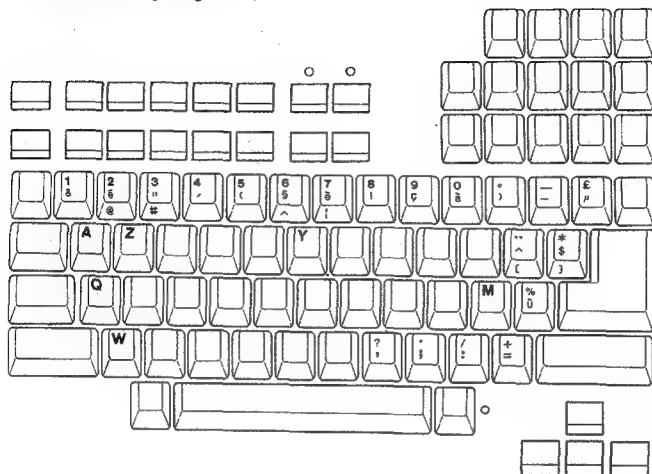
**CE-460KM Spanish keytop kit (21 keytops)**

- For Spanish keyboard



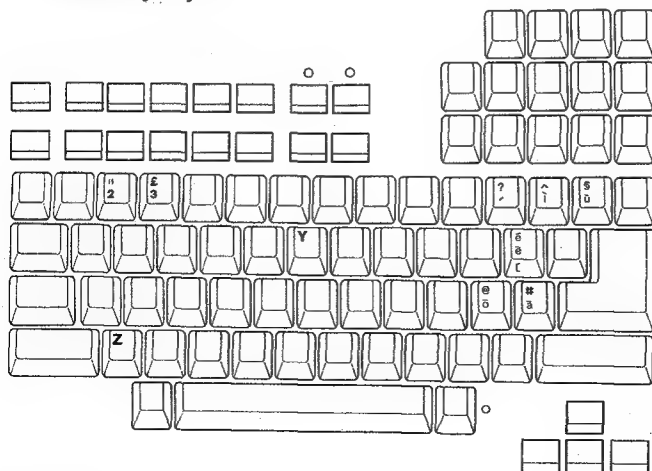
A detailed line drawing of a computer keyboard layout, showing various keys including function keys, letters, numbers, and symbols. The drawing is oriented horizontally and includes a numeric keypad on the right side.

French key layout

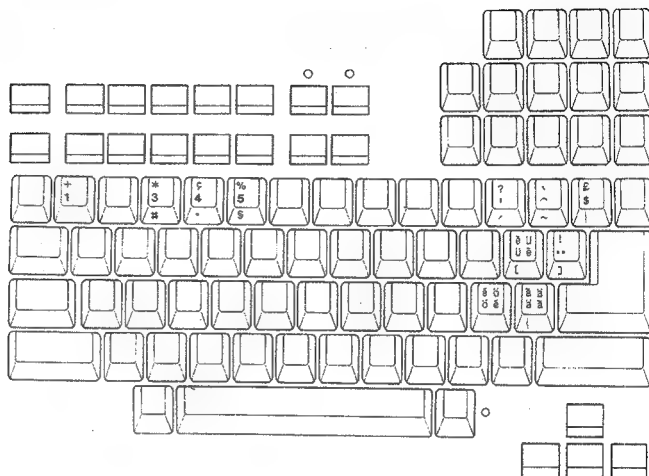


Note: For , use the keytop removed from the base keyboard.

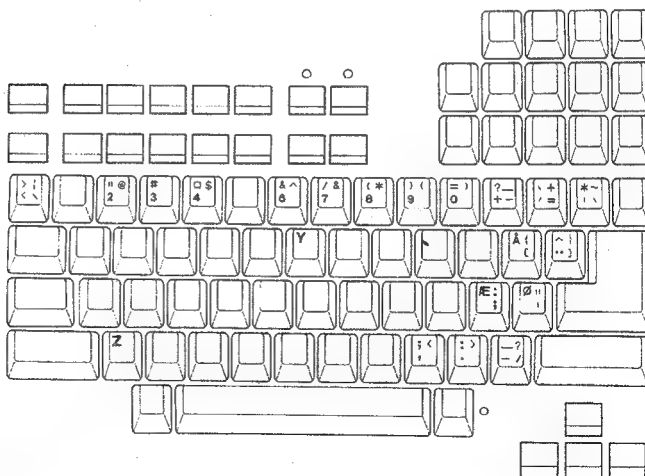
Italian key layout



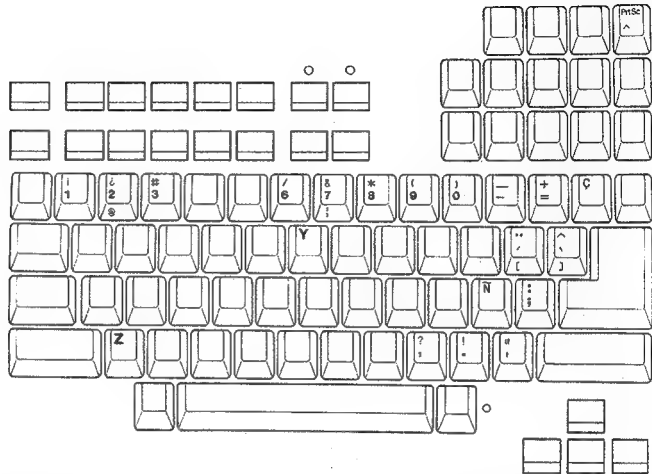
Swiss key layout



Danish layout

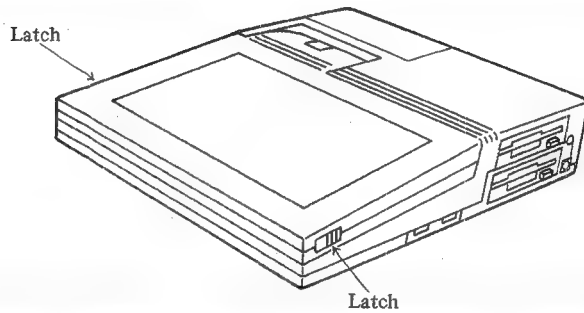


Spanish key layout



Setting Up

Begin by placing the system on a flat surface with the front facing you as shown below. Be sure to fold down the handle so that it is out of your way.



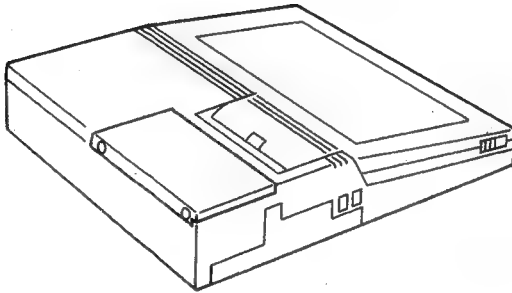
There are four basic steps to setting up your computer:

1. Install the lead battery.
2. Slide the two latches on both sides of the main unit and open the unit.
3. Adjust the screen angle.
4. Install the options as necessary.

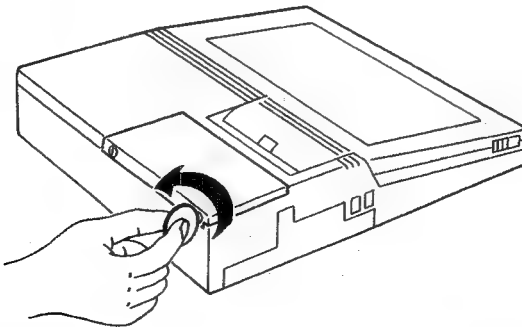
Install the lead battery

When you purchase the computer, you must install the lead battery into the computer in the following manner:

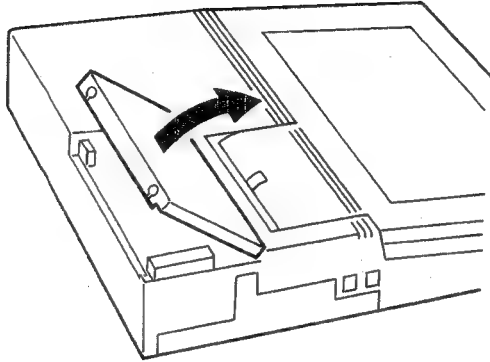
First, place the unit as shown below.



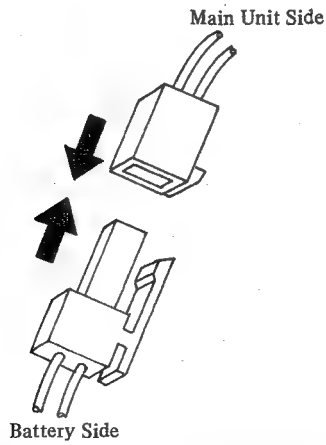
1. Using a coin loosen, but do not remove, the two screws.



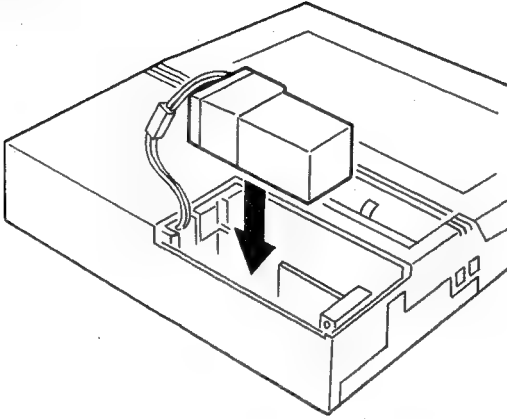
2. Remove the cover.



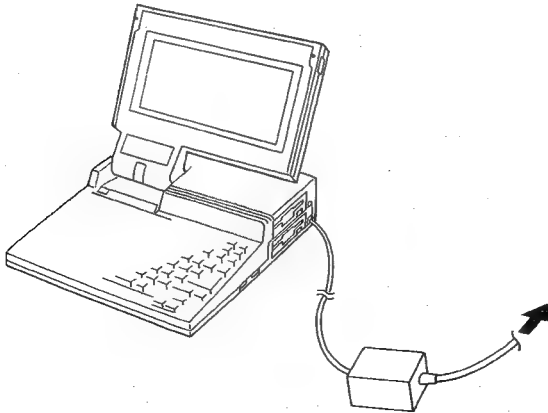
3. Plug the connector attached to the battery into the connector in the main unit.



4. Install the battery carefully in the main unit with the caution label side down.



5. Replace the battery cover.
6. Charge the battery using the AC adaptor.



CAUTION:

Never use any AC adaptor other than the one provided. Otherwise the computer may be damaged due to nonconformity of rated voltage, current and polarity. The AC adaptor input must be of rated voltage and rated frequency. When inserting or disconnecting the plug, hold the plug by hand. The plug must be inserted firmly into the socket. When not using the AC adaptor, be sure to disconnect the plug from the plug socket.

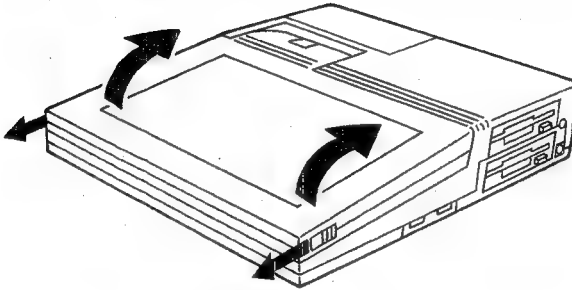
Note: The lead battery is fully charged before shipping from the manufacturer. However, battery life may be reduced as a result of spontaneous discharge during transit. Be sure to charge the battery for approximately 8 hours using the AC adaptor.

7. Power On

When the computer is first turned on after the battery is installed, the set up menu appears on the screen. When setting up, refer to Set Up Functions in Chapter 4 "Using the Computer".

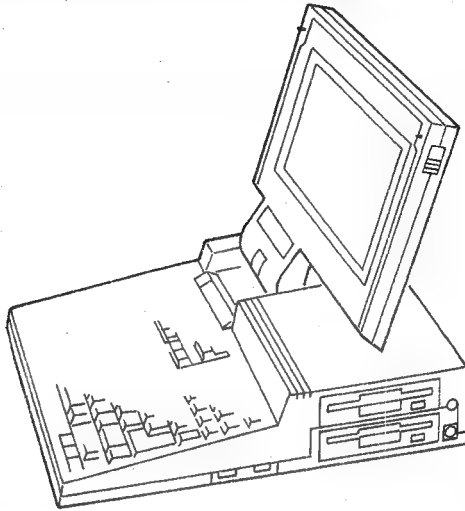
Adjust the Screen Angle

When the unit is opened, the screen and keyboard are ready for use.



To adjust the screen angle, follow the procedure below.

1. Locate and slide forward the latches on both sides of the unit.
2. Open the screen panel and set the screen panel at any viewing angle.



Install Hardware Options

If you want to use the modem card, serial I/O card or co-processor installed in your computer, contact the Sharp Service Center or an authorized Sharp dealer.

If you are using options such as the EMS memory card, see the installation instructions supplied with the option.

Note: Installation instructions for the CE-451A color/monochrome CRT adaptor and CE-452F 5-1/4 inch floppy disk drive unit are supplied as standard sections in this manual.

If you are not using any options, proceed to Chapter 3 for instructions on operating the computer or to the last section of this chapter for instructions on how to close the system.

Note: An accessory bag which contains a screw, a metal plate and a sheet of paper is supplied with the computer. This kit is used when installing the CE-451B in your computer.

Closing Down

This computer is easily transported. It folds up in seconds and is light enough to carry from one location to another. An optional carrying case is available for extensive travel use.

There are four basic steps to closing down the system for transportation:

1. Disconnect any options such as a printer or CRT.
2. Disconnect the AC adaptor plug (if the battery has been charged).
3. Close the screen panel.
4. Pull out the handle.

CAUTION:

Be sure that the power to all equipment is turned off before you begin to close down the system for transportation.

Disconnect Options

Begin by disconnecting any external options such as a printer or CRT. Turn to the appropriate chapter for these instructions.

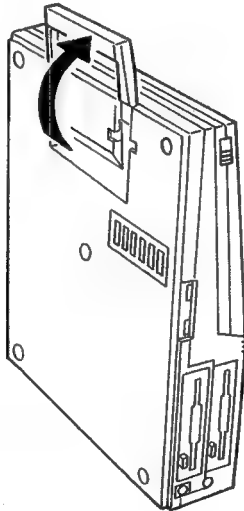
CAUTION:

If you attempt to close the screen panel without turning off power, an alarm beep sounds for about 15 seconds. Whenever you hear a beep, press the ON/OFF button to turn power off.

Take out Handle

The computer's carrying handle can be set as shown below.

Note: When operating the computer, put the handle inside the bottom panel.



Note: When transporting the computer, the CE-451C optional carrying case should be used.

Storage

If you are planning to store the computer, follow these environmental requirements.

Temperature. Do not store the system in temperatures below -20 degrees C (-4 degrees F) or above 60 degrees C (140 degrees F).

Humidity. Do not store the system in humidity greater than 90 percent.

Note: If you plan to store the system for an extended period of time, the built-in battery will discharge and the clock and set up selections will be lost. For longer service life of the lead battery, recharge it every 6 months.

How It Works

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Overview

This chapter describes how to operate and control the computer.

The first section describes how to operate the main unit's screen and floppy disk drive.

The second section describes how to use the keyboard.

The third section provides an overview of how software is used with the system.

The fourth section describes how to properly handle floppy diskettes.

The fifth section describes how to properly handle the hard disk.

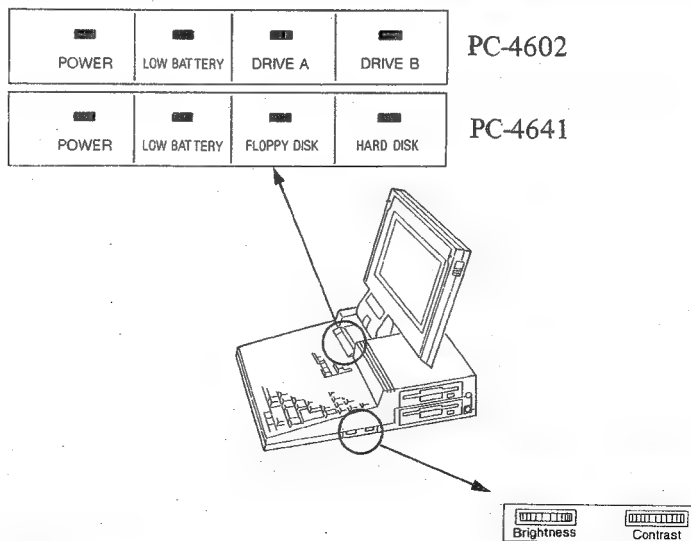
The sixth section shows the character set of this computer.

The Main Unit

The main unit is the heart of the system. In addition to processing, displaying and storing data, it also serves as the connector point for external devices such as a printer, telephone, and CRT. Let's take a closer look at the main unit.

First, if you have not already done so, set up the computer as described in Chapter 2. Next, sit down in front of the system while we take a quick tour.

The indicator panel, the screen contrast control and brightness control of the main unit are illustrated below.



The Screen

The screen displays text and graphics on a flat panel supertwist illuminated crystal display. Normally, information displays as dark characters on a light background. You can also configure the screen to display light characters on a dark background.

These are three important features for controlling the screen:

- ▲ Brightness
- ▲ Contrast
- ▲ Tilt

Brightness. A backlight located directly behind the screen controls brightness of the display background.

The backlight's brightness can be adjusted by turning the brightness control located on the right side panel of the main unit. To brighten the display, turn the dial backward. To darken the display, turn the dial forward.

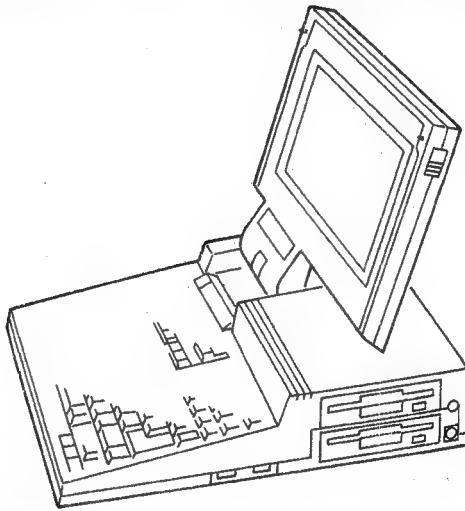
The backlight illuminates automatically when the computer is turned on and remains illuminated while you are operating the computer. If, however, no keys are pressed on the keyboard for a specified period of time, the system automatically turns off the backlight to conserve its life. When this occurs, the screen will appear dim. To turn the backlight on after inactivity, press any key on the keyboard. Since this key is not ignored, be careful when pressing the key.

Backlight Replacement. The backlight will grow dim after extended use. When it no longer provides the desired brightness, the backlight should be replaced.

Contact your Sharp authorized dealer or Sharp service center for replacement of the backlight panel.

Contrast. The contrast between the information that appears on the screen and the background can be adjusted by turning the contrast control located on the right side panel. To lighten the display, locate the contrast control and turn the dial forward. To darken the display, turn the dial backward.

Tilt. To easily view the screen in many sitting positions, the tilt of the screen can be adjusted in the range approximately 90 to 129 degrees from horizontal.



Indicator Panel

There are four indicators on the front panel.

Power. When power is turned on to the main unit, this indicator illuminates in green.

Low Battery Indicator. To the right of the power indicator is the low battery indicator. When battery voltage drops, the low battery indicator illuminates in red and a buzzer sounds for approximately 15 seconds, alerting you to charge with the AC adaptor. If you fail to recharge the battery when the low battery indicator lights, the computer is automatically turned off after approximately 30 (PC-4602) or 10 (PC-4641) minutes when the disk drive is used at the rate of 10 percent with the backlight brightness half to protect the hardware. If this occurs, recharge the battery immediately. Otherwise the clock and set up selections will be lost.

Note: Occasionally, the low battery indicator blinks and an alarm beep sounds during disk drive access, etc. Since this indicates the computer is approaching the low battery condition, recharge the battery.

Drive Indicators. To the right of the low battery indicator are two disk drive indicators.

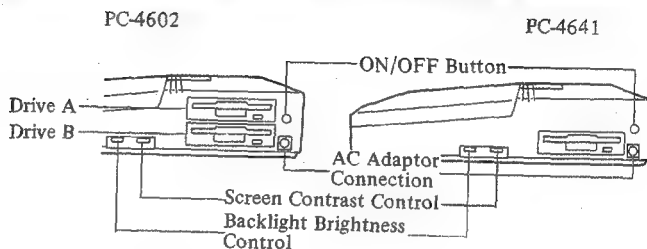
PC-4602: The left one is the floppy disk drive A indicator and illuminates when the system is accessing floppy disk drive A. The right one is the floppy disk drive B indicator and illuminates when the system is accessing floppy disk drive B.

PC-4641: The left one is the floppy disk drive (drive A) indicator and illuminates when the system is accessing the floppy disk drive. The right one is the hard disk drive indicator and illuminates when the system is accessing the hard disk drive.

Let's move on to the right side panel.

Right Side Panel

The right side panel contains the backlight brightness control, the screen contrast control, disk drive(s), disk drive eject button(s), AC adaptor connection and ON/OFF button.



Backlight Brightness Control. There is a control to adjust backlight brightness. Its function is explained in section "Screen".

Screen Contrast Control. To the right of the backlight brightness control is a control to adjust the liquid crystal display contrast. Its function is explained in section "Screen".

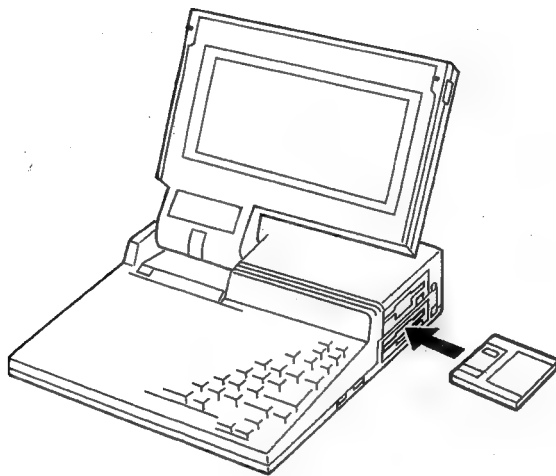
Disk Drive(s). To the right of the screen contrast control are two (PC-4602) or one (PC-4641) floppy disk drives. For the PC-4602, the upper drive is drive A and the lower drive is drive B.

Eject Button(s). There is an eject button(s) for the disk drive(s). It is used to eject the diskette when finished.

CAUTION:

Never push the eject button with no diskette in the disk drive.

The illustration below shows how to insert a floppy diskette into a drive.



To insert a diskette, do the following:

1. Remove the diskette from its storage case.
2. Grasp the diskette by the top and insert into the drive slot so that the diskette label is facing upward.
3. Gently push the diskette into the slot until it comes to a stop.

Note: Be sure to read the section in this chapter about how to handle floppy diskettes.

To remove a diskette, do the following:

1. Press the eject button to partially eject the diskette from the drive.
2. Grasp the diskette and gently pull it out of the drive.
3. Place the diskette back into its storage case.

CAUTION:

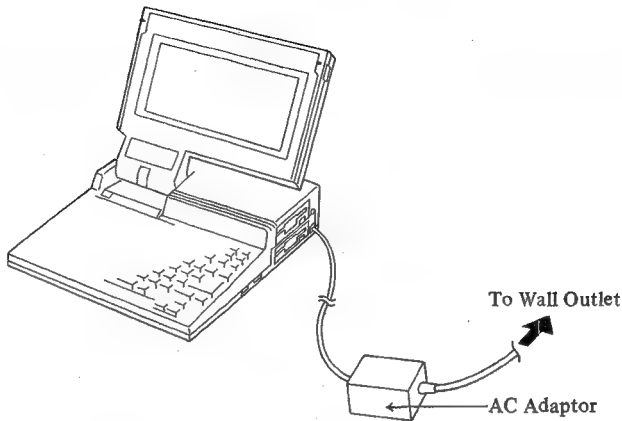
Never attempt to remove a diskette from a disk drive when the disk drive indicator light on the front panel is illuminated. This may cause damage to the contents of the diskette.

Power ON/OFF Button. To turn on the main unit, press the ON/OFF button. To turn off the main unit, press the ON/OFF button again.

Note: You can also turn off the system by pressing the **SetUp** key while holding down the **Ctrl** and **Alt** keys. This method turns the system off in any situation. In the unusual event the power ON/OFF button does not function, you can use this method to turn the system off. Note that the Auto Power ON function through Alarm indicator does not work when the system is turned off using **Ctrl/Alt/SetUp**.

AC Adaptor Connection. The computer can be powered from battery only, AC adaptor only, or can be used while being charged. When the low battery indicator lights while the computer is running, recharge the battery with the AC adaptor.

The illustration below shows how to connect the AC adaptor.



With the computer turned off, the battery is fully recharged after approximately 8 hours.

AC Adaptor. The AC adaptor can serve either as the lead battery recharger or as the computer power source. This adaptor can be used without the lead battery or when the battery has been discharged significantly. Note that the content of clock/calendar and set up function will be lost if the AC adaptor is removed when no battery or a discharged battery is present.

CAUTION:

Never use any AC adaptor other than the one provided. Do not use the AC adaptor for other equipment. Otherwise equipment may be damaged due to nonconformity of rated

voltage, current and polarity. The AC adaptor input must be of rated voltage and rated frequency. When inserting or disconnecting the plug, hold the plug by hand. The plug must be inserted firmly into the socket. When not using the AC adaptor, be sure to disconnect the plug from the plug socket.

Note: Before connecting the AC adaptor, be sure the polarity of the AC adaptor is the same as that of the computer.

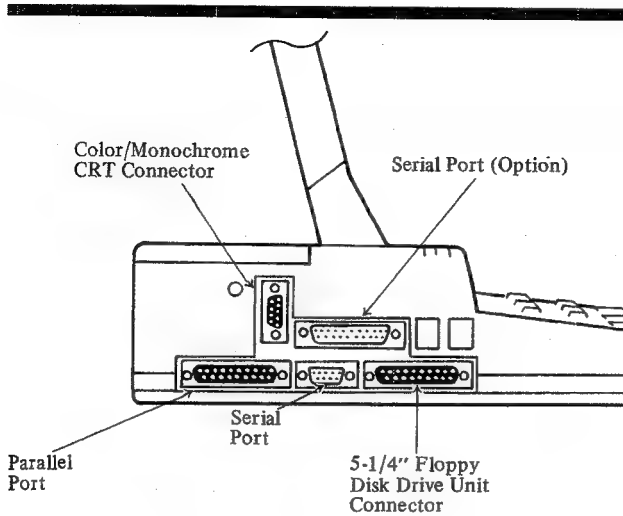


Let's move around to the left side panel.

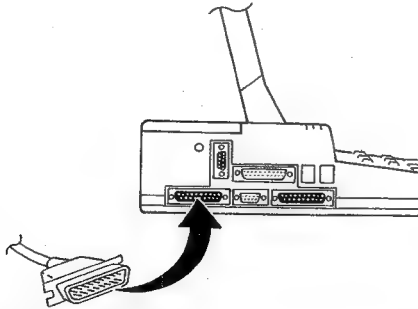
Left Side Panel

As shown in the following illustration, there are several connectors located on the left side panel. Let's look at each one, starting at the left side of the panel.

Note: Dust caps are provided for the 5-1/4" floppy disk port, serial port and parallel port. Remove them before using these connectors and save them for future use.



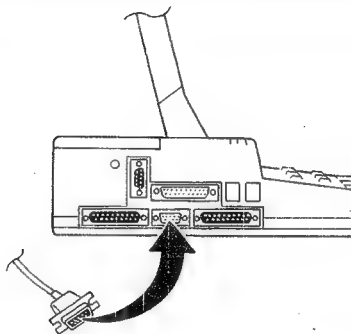
Parallel (Printer) Port. The first connector is the parallel port, used to connect parallel printers to the unit.



The end of the cable connected to this port must be a 25-pin male connector.

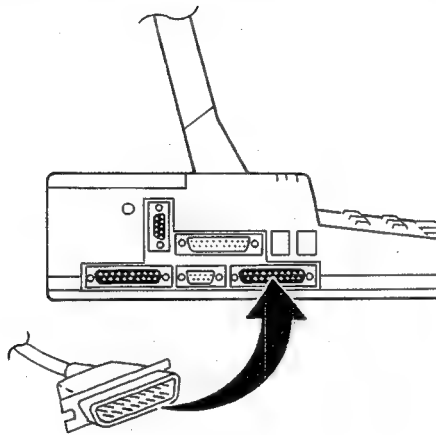
If you need detailed specifications for this port, turn to Appendices.

Serial (RS-232C) Port. The next connector is the serial port, used to connect devices such as an external modem or serial printer, or used for communications.



The end of the cable connected to this port must be a 9-pin female connector. If you need detailed specification for this port, turn to Appendices.

5-1/4" Floppy Disk Drive Unit Port. The next connector is the external floppy disk drive unit port. It is used to connect a 5-1/4" floppy disk drive unit to the computer.

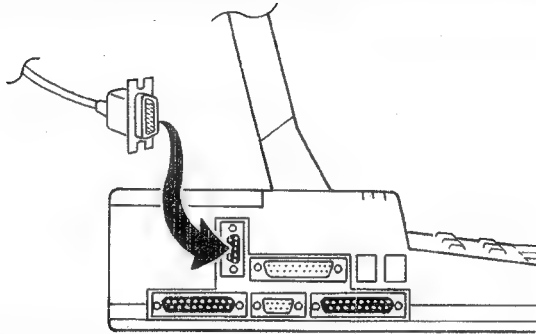


The end of the cable connected to this port must be a 25-pin male connector.

See Chapter 7 for information about using the external floppy disk drive unit with the computer.

If you need detailed specifications for this port, see Appendices.

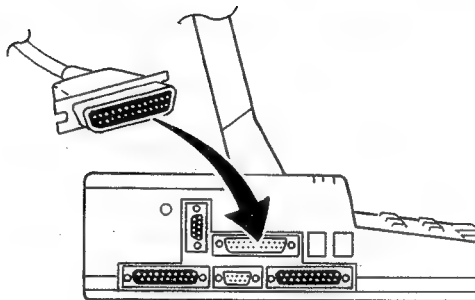
Color/Monochrome CRT Connector. The next connector is used to attach a color or monochrome CRT to your computer.



The end of the cable connected to this port must be a 9-pin male connector.

See Chapter 6 for more information about using a CRT with your system, or turn to Appendices for detailed specifications for this connector.

Serial (RS-232C) Port (Option). The next connector is an optional serial RS-232C port. It is used to connect devices such as serial printers and external modems to the unit.



Note: A protective cap covers this port until the CE-451B serial I/O card is installed.

The end of the cable connected to this port must be a 25-pin female connector.

If you need detailed specifications for this port, see Appendices.

Let's look at the bottom panel.

Bottom Panel

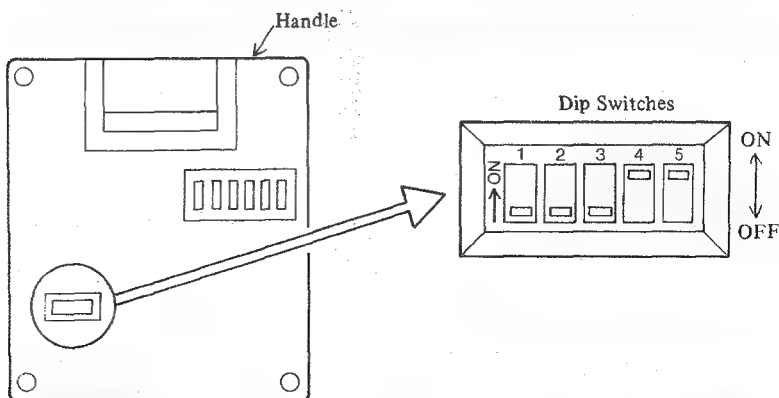
On the bottom panel you will see a handle and some dip switches.

Note: The system for Europe (except U.K.) has no dip switch on the bottom panel, due to the safety regulations.

The dip switches are used to control the following functions by setting them to ON or OFF as specified.

- ▲ System all reset
- ▲ Speaker volume
- ▲ Speaker control
- ▲ Alarm control

The following illustration shows the default setting of dip switches.



Each dip switch has two settings, ON and OFF. To set the dip switches, first put the computer face down.

Note: Remember to turn off power to the computer before setting dip switches. Dip switch settings do not take effect until the computer is turned back on.

To set any dip switch, push it using a pointed object to the desired position:

The available dip switch settings are as follows:

Dip Switch Label	Feature	Setting
1	System All Reset	ON: All Reset OFF: Normal
2	Not Used	
3	Speaker Volume	ON: Speaker volume LOW. OFF: Speaker volume HIGH.
4	Speaker Control	ON: Speaker ON. OFF: Speaker OFF.
5	Alarm Control	ON: Low Battery/Shut off Alarm ON OFF: Low Battery/Shut off Alarm OFF

System All Reset. Dip switch 1 can be used if the system locks up and you are unable to reboot by turning power off and on again. When this switch is moved to the ON position and then back to the OFF position, the unit will proceed with the power-on routine by turning power on.

Note: This operation clears the set up memory.

When you turn power on after this operation, the set up screen appears on the screen. For this screen, see Chapter 4.

Speaker Volume. Dip switch 3 enables you to control the speaker volume.

Speaker Control. Dip switch 4 enables you to turn the speaker off if desired.

Alarm Control. Dip switch 5 enables you to disable or enable the alarm beep when the battery is low or when the system is closed with the power on.

Let's move on to the keyboard.

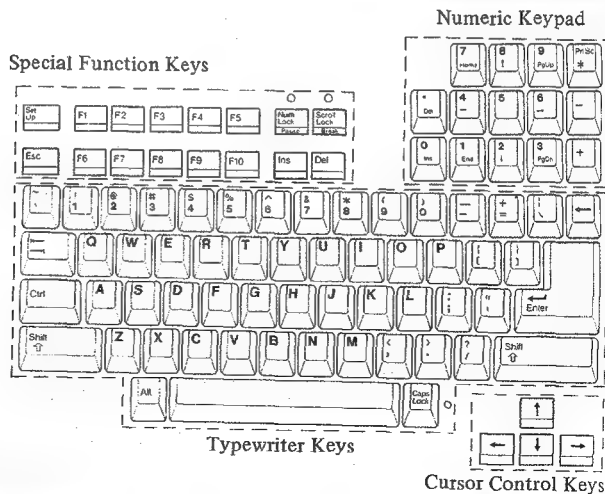
The Keyboard

The keyboard allows you to communicate with the main unit.

The description below provides an overview of keyboard usage. When using applications software, however, certain keys may take on different meanings.

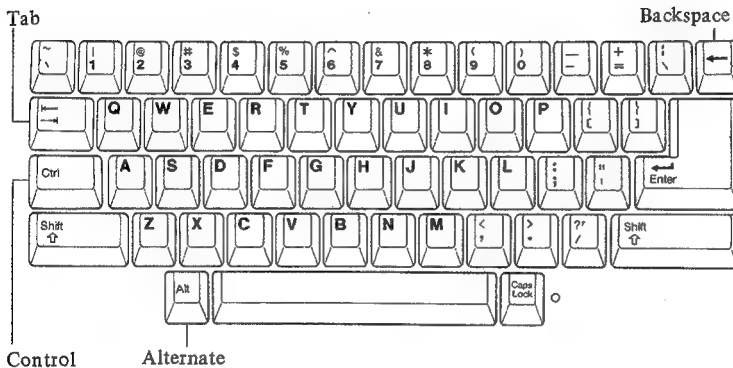
For example, in a word processing application a certain key might be used to insert text in a line, while in a spreadsheet application, the same key might not have any use. Be sure to read your application documentation for specific use of keys.

The keyboard is divided into four basic groups — typewriter keys, special function keys, numeric keypad, and cursor control keys.



Typewriter Keys

The typewriter keys are similar in function and appearance to those found on a standard typewriter. There are some keys in this group, however, that you might not be familiar with.



Enter. The **Enter** key is generally used to end a line or end an entry. In some application documentation, this key is referred to as **Return** or **↵** key.

Shift. There are two **Shift** keys located on the left and right sides of the typewriter keys. Pressing a key while holding down **Shift** gives you uppercase.

Caps Lock. The **Caps Lock** key allows you to type all the letters in uppercase. It is a toggle key which means pressing it once turns it on and pressing it again turns it off. When **Caps Lock** is on, the indicator light on the right of the key illuminates.

Caps Lock affects letter keys only. **Shift** is used when **Caps Lock** is on to type uppercase symbols and punctuation marks.

Shift also reverses the action of **Caps Lock** when typing letters. If you press **Shift** when the **Caps Lock** key is on and type a letter, you get a lowercase letter.

Tab. The **Tab** key works like the tab key on a regular typewriter. In certain applications, you can return to the last tab in a line by pressing **Tab** while holding down **Shift**.

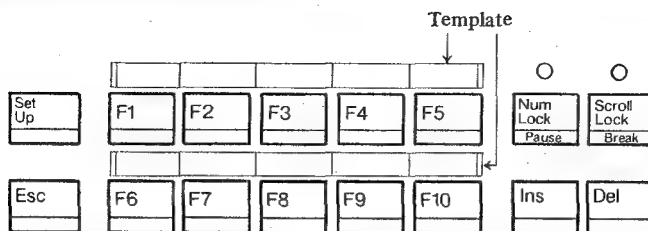
Backspace. The **Backspace** key works like the backspace key on a typewriter, backing up one character position at a time. In some applications, **Backspace** erases characters as it backs up.

Control. The **Ctrl** key, when used with another key, sends a special instruction to the system. For example, in a word processing application, pressing **Ctrl** and **P** together might tell the system to stop printing a document.

Alternate. Like **Ctrl**, the **Alt** key provides an alternate function or accesses characters from the extended character set. (See “Character Set” in this chapter.)

Special Function Keys

At the top of the keyboard are 10 function keys labeled F1 through F10 and 6 other keys as shown in the illustration below.



Function Keys. These keys perform editing functions in MS-DOS* and have application defined functions at other times. Refer to your application documentation for a description of these keys.

Note: Directly above the function keys are blank templates. You can write labels on the template to identify functions for each key.

Other Keys

Set Up. Pressing **Set Up** accesses the set up screen where you can define certain characteristics of the system. See Chapter 4 for more information about this screen.

Escape. The **Esc** key is frequently used in applications to cancel a command or exit the application.

Number Lock. The **NumLock** toggle key affects only the numeric keypad, allowing you to enter numbers using the numeric keypad.

When **NumLock** is on, pressing keys labelled 0 through 9 and decimal point results in a number. When **NumLock** is on, the **Shift** key can be used to activate the cursor control keys.

When pressed with **Ctrl**, **NumLock** suspends the system operation, pausing the display of text on the screen. To restart, press any key.

Scroll Lock. This key has no function when used alone. When pressed together with **Ctrl**, **Scroll Lock** provides a break function, stopping programs that are running.

Insert. The **Ins** key is used to insert text.

Delete. The **Del** key is used to delete text.

Numeric Keypad

To the right of the function keys is a numeric keypad.



Cursor Control. The keys labelled 1 through 9 can be used as an alternative to the typewriter number keys or as a way to control the movement of the cursor — the underline or block character that you move around the screen.

When the system is first turned on, these keys control the movement of the cursor. The arrow keys move the cursor up or down one line at a time and to the right or left one character at a time.

The **Home**, **PgUp**, **PgDn**, and **End** keys also move the cursor around the screen. In general:

The **Home** key moves the cursor to the upper left corner of the screen.

The **PgUp** key moves the cursor back one full screen.

The **PgDn** key moves the cursor ahead one full screen.
The **End** key moves the cursor to the last character in a file.

Insert. The **Ins** key is used to insert text. When used with **Shift**, the **O** can be accessed.

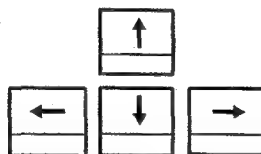
Delete. The **Del** key is used to delete text. When used with **Shift**, the decimal point can be accessed.

Print Screen. Pressing **PrtSc** while holding down **Shift** prints whatever is on the screen. Pressing **PrtSc** alone results in an asterisk.

Numeric +/– keys. Like those on the typewriter keys, they are used to type the **+** and **–** characters.

Cursor Control Keys

Beneath (to the right) of the typewriter keys are the cursor control keys.



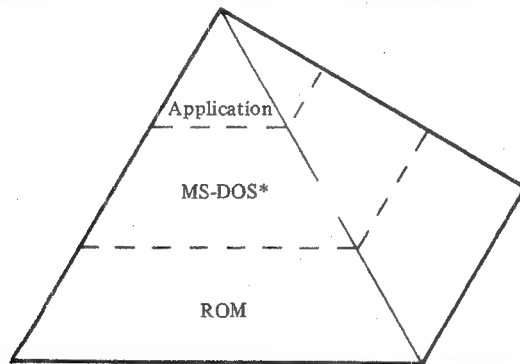
These keys control the movement of the cursor — the underline or block character that you move around the screen.

The arrow keys move the cursor up or down one line at a time and to the right or left one character at a time.

The Software

As you learned in Chapter 1, a computer system needs software to be useful. Without software, your computer is just a collection of electrical components.

In order to understand how software functions on the computer, think of it in three levels.



When power is turned on to the system, software and hardware begin to interact.

Software stored in ROM (read only memory) is installed into the computer at the factory. Sometimes referred to as firmware, it performs three basic functions when the system is first turned on:

- ▲ Checks performance of hardware components
- ▲ Determines what external devices (e.g., CRT, printer) are connected to the main unit.
- ▲ Loads (reads) MS-DOS* from a diskette or the hard disk into main memory

Once MS-DOS* is loaded into main memory, you can enter various MS-DOS* commands.

You can also instruct MS-DOS* to load an application such as word processing into main memory. Chapter 4 describes in detail how to load and run an application.

The Diskettes

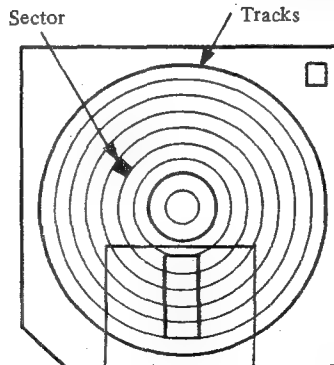
A diskette is a magnetic device that stores information created on a computer. Once information is stored on a diskette, it can be re-used whenever necessary or replaced when no longer needed.

The computer uses 3-1/2 inch, double-sided, double density diskettes that store up to 720K (approximately 720,000 characters) of information.

Diskette Format

In order for information to be stored on a diskette, the operating system must first prepare — format — the diskette. This process enables stored information to be easily located.

During formatting, the diskette is divided into 80 circular tracks, similar to those on a record.



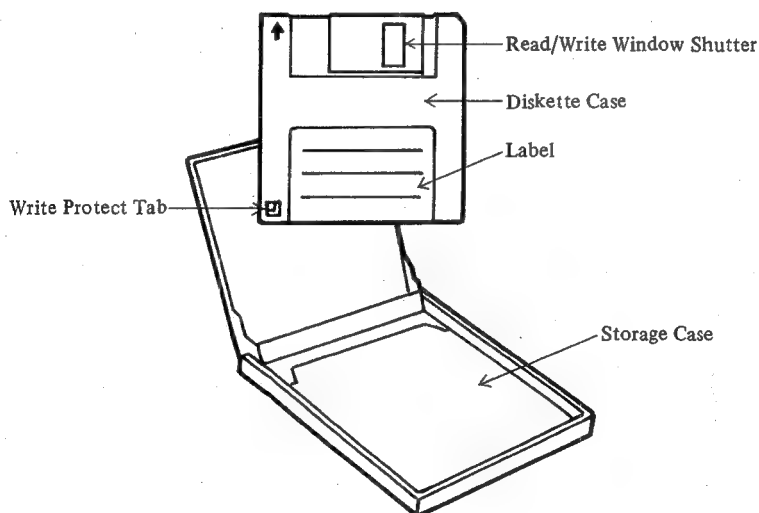
Each track is further divided into sectors that identify information stored within the track. The track number and sector number act like addresses to the computer, making access to information an automatic and rapid process.

During operation, the diskette rotates inside its protective jacket. As it rotates, the read/write head of the drive moves from one track to another, locating information or finding space available for new information. You need not be concerned where information is stored on a diskette. MS-DOS* will manage that function automatically.

Diskette Handling Procedures

To safeguard information stored on diskette, it is important that you handle diskettes with care.

The illustration below shows what a typical diskette looks like.



Storage Case. Some diskettes come with a storage case to protect the diskette. Return the diskette to its storage case after use.

Diskette Case. The diskette itself is permanently encased in a plastic jacket to protect its magnetic surface. This jacket can not be removed.

Label. The label identifies the content of the diskette. The label should be placed over the recessed area of the diskette.

Read/Write Window Shutter. The read/write window shutter allows the disk head to read from and write to the diskette.

Write Protect Tab. The write protect tab can be positioned to prevent changes to important files. To protect a diskette, slide the write protect tab to the open position; to allow the computer to write on the diskette, slide the tab to the closed position.

Follow these procedures when handling diskettes:

- ▲ Return the diskette to its storage case after use.
- ▲ Never bend or twist the diskette.
- ▲ Never expose the diskette to liquids. If you spill a liquid on the diskette, throw the diskette away.
- ▲ Never expose diskettes to excessive heat or direct sunlight.
- ▲ Always keep diskettes at least 3 meters (10 feet) away from magnetic fields such as those in electronic equipment and telephones.

- ▲ Always store diskettes in a cool, dry, dust free area, in an upright position.
- ▲ Never place heavy objects such as books on the diskettes.

The Hard Disk

The hard disk is a magnetic device fixed to the axis, and each side of the disk has a magnetic head to read/write information. The hard disk drive uses a fully integrated, floating head system externally isolated for operation, providing high speed, large capacity, and high reliability.

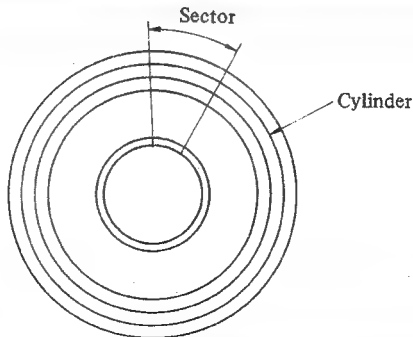
The PC-4641 contains a 3-1/2 inch hard disk that stores up to 40 megabytes of information.

Hard Disk Format

Like diskettes, the hard disk must first be formatted by the operating system in order to store information.

During formatting, the hard disk is divided into 614 cylinders. A cylinder is a collection of tracks in the same position on different sides of the hard disk(s).

Each cylinder is further divided into 17 sectors per side. Each sector holds 512 bytes of data. Read/write can be performed in sector units.



Hard Disk Drive Handling Procedures

The hard disk drive is a precision device that requires particular care in handling.

Follow these procedures when handling the PC-4641.

- ▲ When you finish working with the hard disk, be sure to execute the HDTRNS command by typing HDTRNS at the MS-DOS prompt and pressing the **Enter** key. This command positions the hard disk heads where they will be least affected by vibration and shocks.
- ▲ Do not subject the unit to vibration and shocks, especially during transportation.
- ▲ Backup copies of all programs and data should be retained on floppy diskettes to prevent loss or damage in the event of disk or hardware failure. The data once lost can never be restored unless you have backup copies.
- ▲ To move the unit to a temperature more than 10 degrees C (18 degrees F) different from its present location, first move it to a temperature difference of less than 10 degrees C (18 degrees F) for one hour, then gradually increase or decrease the temperature.

Character Set

The following table shows the character set along with decimal and hex codes.

DECIMAL VALUE		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
HEX VALUE		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	SPACE	▶	◀	0	@	P	'	p	Ç	É	á				α	≡
1	1	☺	◀	!	1	A	Q	a	q	ü	æ	í				β	±
2	2	☹	↑	"	2	B	R	b	r	é	Æ	ó				Γ	≈
3	3	♥	!!	#	3	C	S	c	s	â	ô	ú				π	≤
4	4	♦	π	\$	4	D	T	d	t	ä	ö	ñ				Σ	∫
5	5	♣	§	%	5	E	U	e	u	à	ò	Ñ				σ	∫
6	6	♠	■	&	6	F	V	f	v	á	û	ä				μ	÷
7	7	•	↑	'	7	G	W	g	w	ç	ù	ó				τ	≈
8	8	•	↑	(	8	H	X	h	x	ê	ÿ	¿				ø	°
9	9	○	↓	)	9	I	Y	i	y	ë	Ö					θ	°
10	A	●	→	*	:	J	Z	j	z	è	Ü					Ω	•
11	B	♂	←	+	;	K	I	k	{	ï	ç	½				δ	√
12	C	♀	└	,	<	L	\	l	!	î	£	¼				∞	n
13	D	♪	↔	—	=	M	I	m	}	ì	¥	ì				φ	²
14	E	♫	▲	.	>	N	^	n	~	Ä	Pt	«				€	ℓ
15	F	☼	▼	/	?	O	_	o	△	Å	ƒ	»				∩	ℓ

Note: Some of the characters in the character set (32 to 126 and 128 to 255) can be entered in the MS-DOS command line. To enter the character, type its decimal code while holding down the **Alt** key. When you release the **Alt** key, the character will be displayed on the screen.

(for Denmark/Norway)

DECIMAL VALUE	HEXA-DECIMAL VALUE	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
↓	HEXA-DECIMAL VALUE	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	BLANK	▶	BLANK	0	@	P	'	p	Ç	É	á				α	≡
1	1	☺	◀	!	1	A	Q	a	q	ü	æ	í				β	±
2	2	●	↑	"	2	B	R	b	r	é	Æ	ó				Γ	≥
3	3	♥	!!	#	3	C	S	c	s	â	ô	ú				π	≤
4	4	♦	π	\$	4	D	T	d	t	ä	ö	ñ				Σ	∫
5	5	♣	§	%	5	E	U	e	u	à	ò	Ñ				σ	∫
6	6	♠	■	&	6	F	V	f	v	å	û	õ				μ	÷
7	7	•	⬆	'	7	G	W	g	w	ç	ù	Ö				τ	≈
8	8	•	↑	(	8	H	X	h	x	ê	ÿ	¿				ø	°
9	9	○	↓	)	9	I	Y	i	y	ë	Ö	ä				θ	•
10	A	◉	→	*	:	J	Z	j	z	è	Ü	Ä				Ω	•
11	B	♂	←	+	;	K	I	k	{	ï	ø	ℓ				δ	√
12	C	♀	└	,	<	L	\	l		î	£	´	n			∞	n
13	D	♪	↔	—	=	M	I	m	}	ì	Ø	í				φ	2
14	E	♫	▲	.	>	N	^	n	~	Ä	É	³				€	!
15	F	☼	▼	/	?	O	_	o	△	Å	Í	◻				∩	BLANK

Using the Computer

Overview

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System Start-up

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Overview

This chapter describes how to use the resources of the computer to accomplish your computing needs.

The first section describes system start-up procedures.

The second section shows how to use the set up functions.

The third section describes how to run an application such as word processing or spreadsheets on the computer.

System Start-up

To start up the system, begin by locating the MS-DOS* diskette supplied with the computer and remove it from its storage case.

Next, do the following:

1. Insert the MS-DOS* Master diskette into floppy disk drive A.
2. Turn on power to the main unit. The system will go through its internal check procedures and display the following text on the screen:

```
The Sharp Personal Computer System
Firmware Version x.xx
Copyright (C) 1988 by Sharp Corporation
Copyright (c) 86, 87, 88 by Vadem Inc.
```

```
Processor      Passed.
Firmware ROM   Passed.
Keyboard       Passed.
Clock          Passed.
Setup RAM      Passed.
xxxK Memory.
```

```
Loading A:
```

Note: If you are using the computer for the first time or just replaced the battery, turning power on to the main unit displays the set up screen. For details about this screen, see the next section.

3. After a few seconds, the system begins to load MS-DOS* from the floppy diskette in drive A into main memory. Once MS-DOS* is loaded, the following message displays indicating that the system has started up (sometimes called "booted"):

```
The Sharp Personal Computer System  
I/O Subsystem Version x.xx  
Copyright (C) 1985,1986,1987,1988 by Vadem Inc.  
All Rights Reserved.
```

```
A>PATH
```

```
A>VER
```

```
MS-DOS Version 3.30
```

```
A>
```

```
A>
```

Copying MS-DOS*

After you have started MS-DOS* for the first time, the first thing you should do is to make one or more copies of the MS-DOS* original diskette. By specifying the country code and keyboard code for the backup diskette(s), the date and time format, currency symbol, decimal separator and keyboard arrangement corresponding to the specified codes will automatically be set whenever you start MS-DOS* using the backup diskette.

Prepare one or more blank diskettes. It is recommended to attach a label "Working diskette" on these diskettes.

Make sure that the original MS-DOS* diskette is set in drive A and the A > prompt is issued on the screen. Enter the following command.

```
SELECT xxx yy
```


xxx represents the country code, and yy represents the keyboard code. The available combinations are listed in the table below.

Country	Country code	Keyboard code	Date format	Time format
United States	001	US	mm-dd-yy	hh:mm:ss,cc
Netherland	031	US	dd-mm-yy	hh:mm:ss,cc
France	033	FR	dd/mm/yy	hh:mm:ss,cc
Spain	034	SP	dd/mm/yy	hh:mm:ss,cc
Italy	039	IT	dd/mm/yy	hh:mm:ss,cc
Switzerland-German	041	SG	dd.mm.yy	hh.mm.ss.cc
Switzerland-French	041	SF	dd.mm.yy	hh.mm.ss.cc
United Kingdom	044	UK	dd-mm-yy	hh:mm:ss,cc
Denmark	045	DK	yy-mm-dd	hh.mm.ss.cc
Sweden	046	SV	yy-mm-dd	hh.mm.ss.cc
Norway	047	NO	dd/mm/yy	hh.mm.ss.cc
Germany	049	GR	dd.mm.yy	hh.mm.ss.cc
Australia	061	US	dd-mm-yy	hh:mm:ss,cc
Finland	358	SU	dd-mm-yy	hh:mm:ss,cc

The SELECT command will perform the following:

1. Format a new diskette.
2. Make a copy of MS-DOS*/GW-BASIC* master diskette.
3. Set the keyboard arrangement, date and time format, etc.

To select United Kingdom, for example, type

```
SELECT 044 UK
```

and press **Enter**.

Note. If you are using the PC-4641 with an optional external floppy disk drive attached, disconnect it and execute all reset before executing the SELECT command.

For Users of the PC-4602

Enter the following command:

```
A> SELECT xxx yy
```

Then the following message appears on the screen:

```
SELECT is used to install DOS the first  
time.  SELECT erases everything on the  
specified target and then installs DOS.
```

```
Do you want to continue (Y/N)? Y
```

Simply press the **Enter** key. Then after a few seconds, the following message is displayed:

```
Insert new diskette for drive B:  
and strike ENTER when ready
```

Insert a blank diskette in drive B and press **Enter** when ready. The system begins to format a diskette in drive B and then copies system on it. After formatting is completed, the following message is displayed:

```
Format another (Y/N)?
```

Type N and press **Enter**. The system automatically begins to copy the contents of the diskette in drive A to the diskette in drive B. When all operations are completed, remove the original MS-DOS* diskette from drive A, and use the backup diskette for succeeding operation.

For users of the PC-4641

Enter the following command:

```
A> SELECT xxx yy
```

Then the following message appears on the screen:

```
SELECT is used to install DOS the first  
time.  SELECT erases everything on the  
specified target and then installs DOS.
```

```
Do you want to continue (Y/N)? Y
```

Simply press the **Enter** key. Then after a few seconds, the following message is displayed:

```
Insert new diskette for drive B:  
and strike ENTER when ready
```

Remove the original MS-DOS* diskette from drive A and insert a blank diskette into drive A. Press **Enter** when ready. The system begins to format a diskette in drive A and then copies system on it. After formatting is completed, the following message is displayed:

```
Format another (Y/N)?
```

Type N and press **Enter**. Then the following message appears:

```
Insert diskette for drive A:  and strike  
any key when ready
```

Insert the original MS-DOS* diskette into drive A and press any key on the keyboard. The following information issued on the screen. The computer then begins to load the contents of the original MS-DOS* diskette into memory.

```
Reading source file(s)...
```

When reading is over, the message below is displayed.

Insert diskette for drive B: and strike any key when ready

Remove the original MS-DOS* diskette from drive A and insert the formatted diskette into drive A. Press any key on the keyboard when ready. The contents temporarily stored in memory are written onto the blank new diskette. When copying is completed, A > prompt is issued. The new files (programs) have been automatically added to the copied MS-DOS* system diskette by the SELECT command.

Once backup diskettes are made, the original MS-DOS* diskette is seldom used. Keep it in a safe place where it is not affected by magnetic fields or heat and use the backup diskettes for daily operation.

Insert your new backup diskette in drive A and press the Ctrl, Alt and Del keys simultaneously. The message requesting you to enter the date is displayed, and you may notice that the month/day/year format is different from the original MS-DOS diskette. Enter the date and time, and the A > prompt is displayed. Press any character key on the keyboard, and you may find that different characters are displayed on the screen.

Additional Keyboard Operations

U.S. English Keyboard Mode. After changing the computer's internal key assignment, you can change the keyboard mode to the U.S. English mode and back to your keyboard mode any time. To change to the U.S. English mode, press the **F1** key while holding down **Ctrl** and **Alt**. To return to your keyboard mode, press the **F2** key while holding down **Ctrl** and **Alt**.

Dead Key Characters. There are some special characters on the keyboards other than the U.S. English, U.K. English, and Italian keyboards. When used alone, they display nothing on the screen and cause no cursor movement. They are called dead key characters, and used to accent some specific letters. To enter a letter with a dead key character, first type the dead key character and then the letter.

Special Characters. Some keyboards have characters on the front face or right side of keys. These characters can be typed using the **Ctrl** and **Alt** keys.

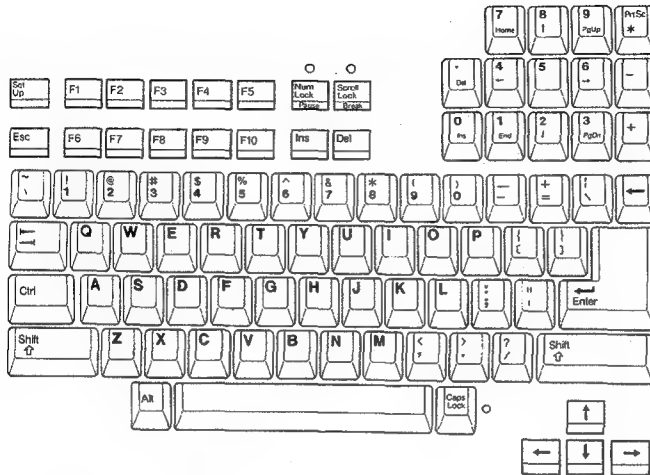
While holding down the **Ctrl** and **Alt** keys, press the key with a character on its front face or right side, and the character will be typed.

Keyboard Layouts

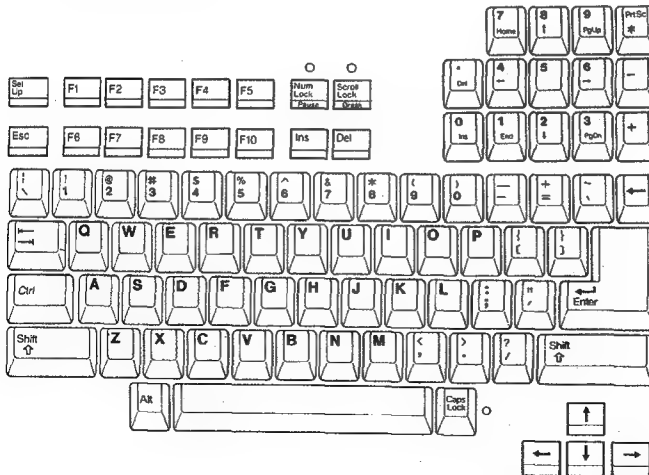
The following illustrations show the keyboard layouts which can be set using the **SELECT** command.

Note: The shaded characters are "dead key characters" described above.

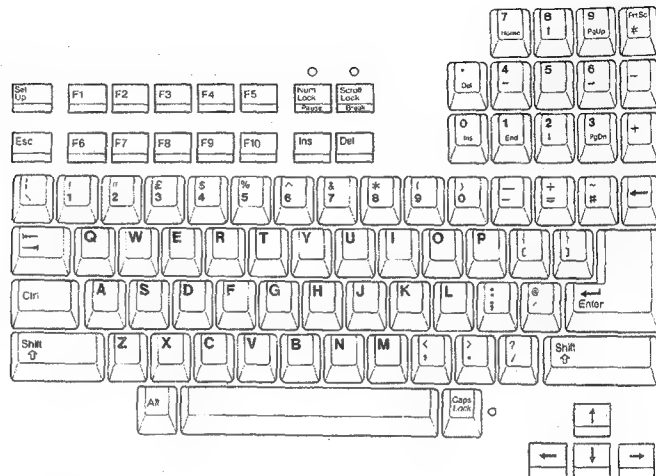
U.S. English



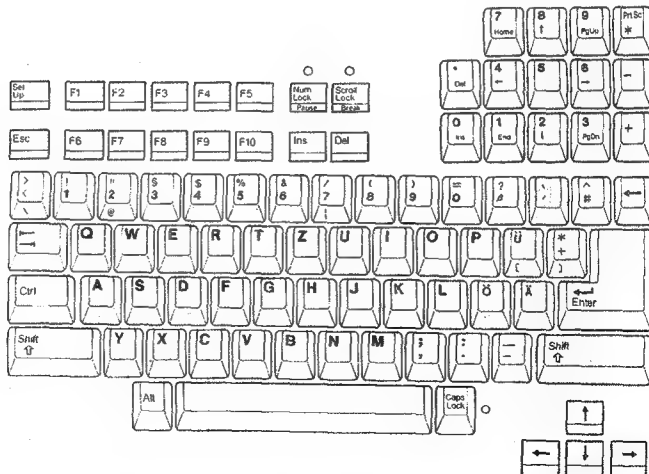
European English



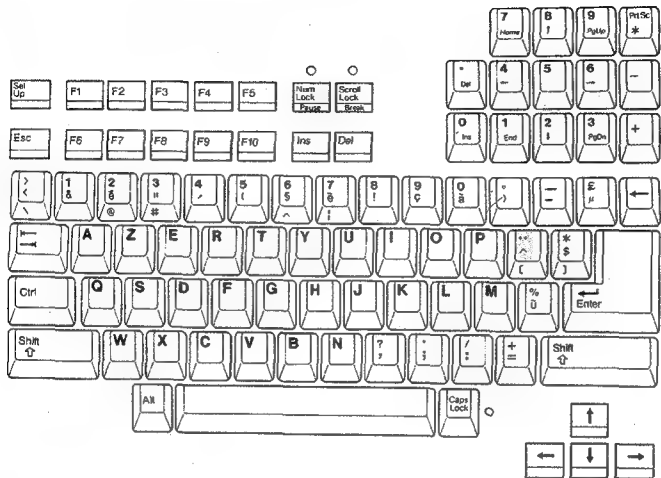
U.K. English



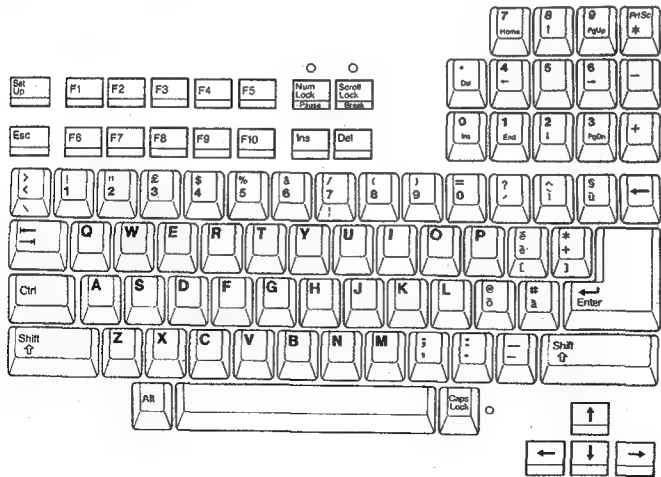
German



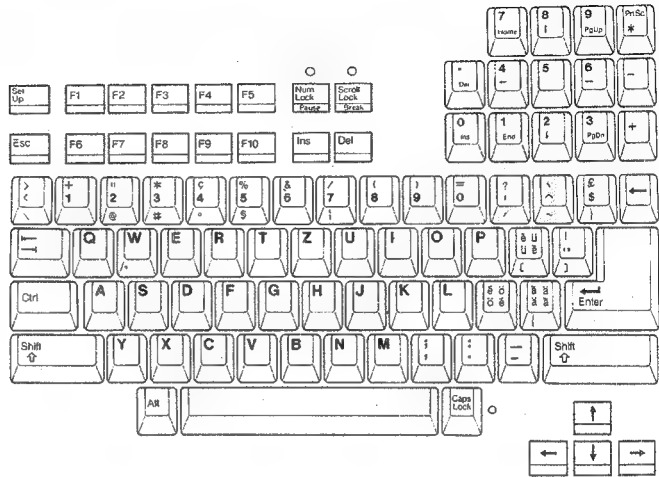
French



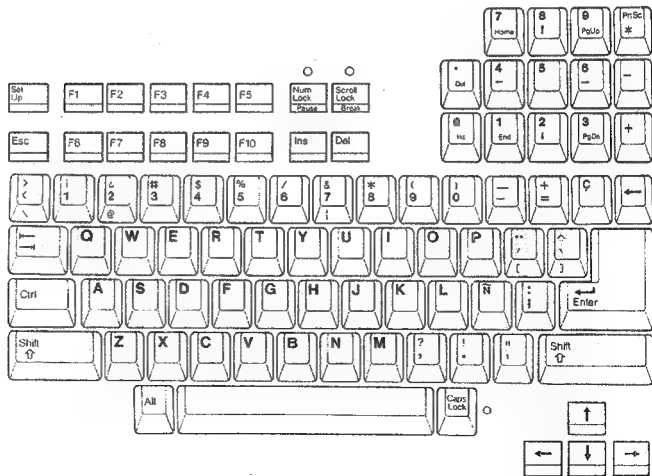
Italian



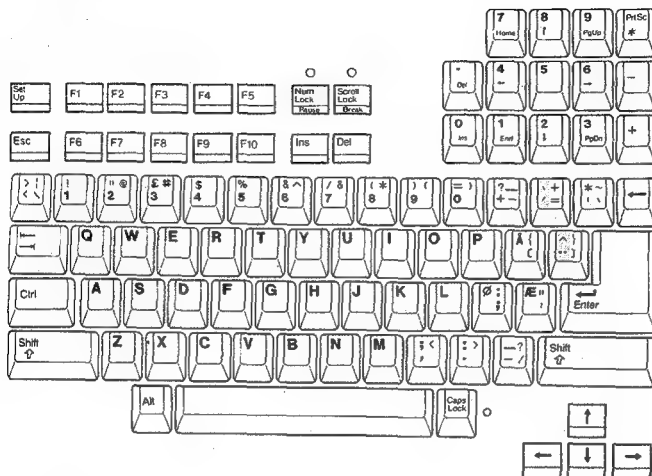
Swiss



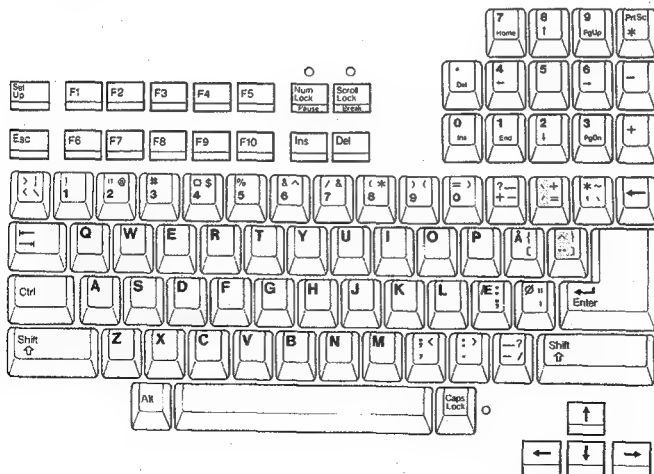
Spanish

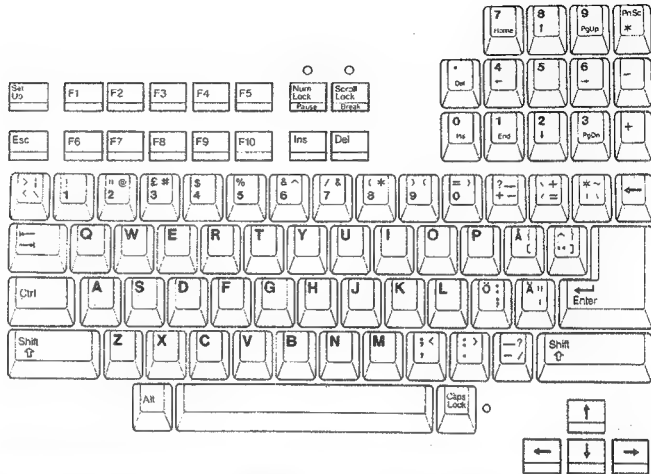


Norwegian



Danish



Swedish/Finnish

Using the Hard Disk (PC-4641)

As with the floppy diskette, the hard disk must be formatted in order to be used with MS-DOS*. Before formatting, however, the hard disk requires a special process to prepare the MS-DOS* area on the hard disk.

The hard disk can be divided into separate areas (partitions). Each partition is assigned to an operating system.

When you use the hard disk for the first time, no partition is assigned to the hard disk. You can create one or more MS-DOS* partitions on the hard disk using the MS-DOS* FDISK command.

Preparing the Hard Disk for Use

The MS-DOS* hard disk preparation program (FDISK) is used to create, change, or erase the MS-DOS* partition(s). You can treat only the MS-DOS* partition(s) with the FDISK command. Other partitions will be created, changed, or erased by the other operating system's hard disk preparation program.

You can create multiple MS-DOS* partitions on a hard disk of the size(s) you desire.

See Appendix D of the MS-DOS manual for further details.

Since the maximum size for one MS-DOS* partitions is approximately 32Mb, you must create two or more MS-DOS* partitions to use the entire (40Mb) hard disk.

The following procedure configures the hard disk as two 20Mb partitions, "primary" and "extended" and then formats them.

1. Insert the MS-DOS* diskette in floppy disk drive A and turn on power to the computer.
2. When the system has started up and the MS-DOS* prompt (A >) appears, enter the FDISK command and press the **Enter** key. The following display appears:

```
Fixed Disk Setup Program Version x.xx  
(C) Copyright Microsoft. 1985-1987.
```

FDISK Options

Choose one of the following:

1. Create DOS Partition
2. Change Active Partition
3. Delete DOS Partition
4. Display Partition Data

Enter choice:[1]

Press ESC to return to DOS

3. Press the **Enter** key, then the display changes to the following:

Create DOS Partition

Current Fixed Disk Drive: 1

1. Create Primary DOS Partition
2. Create Extended DOS Partition

Enter Choice: [1]

Press ESC to return to FDISK Options

4. Press **Enter** again, and the following appears:

```
Create Primary DOS Partition

Current Fixed Disk Drive: 1

Do you wish to use the maximum size
for a DOS partition and make the DOS
partition active (Y/N)..... ? [Y]
```

5. Type **N** and press **Enter**. The screen displays the following:

```
Create Primary DOS Partition

Current Fixed Disk Drive: 1

Partition  Status   Type   Start   End   Size

Total disk space is 614 cylinders.

Maximum space available for partition
is 614 cylinders.

Enter partition size ..... [614]

No partition defined

Press ESC to return to FDISK Options
```

6. Since we will make two partitions of a size, type **307** (half of the total size) and press **Enter**. This will create the first (primary) 20Mb DOS partition. Press **Esc** to return to the FDISK Options menu.
7. The second 20Mb DOS partition is created as an extended DOS partition. Press **Enter** in the FDISK Options menu to enter the Create DOS Partition menu, type **2** and press **Enter**. Then the following appears:

Create Extended DOS Partition

Current Fixed Disk Drive: 1

Partition	Status	Type	Start	End	Size
C: 1		PRI DOS	0	306	307

Total disk space is 614 cylinders.

Maximum space available for partition
is 307 cylinders.

Enter partition size [307]

Press ESC to return to FDISK Options

8. This time simply press **Enter** to use the default partition size.
9. The next step is to specify a drive letter to the second DOS partition. Press **Esc**. The following appears:

Create Logical DOS Drive(s)

No logical drives defined

Total partition space is 307 cylinders.

Maximum space available for logical
drive is 307 cylinders.

Enter logical drive size [307]

Press ESC to return to FDISK Options

10. Simply press **Enter** to specify the entire extended DOS partition as one drive.
11. Press **Esc** to return to the FDISK Options menu.
12. The next step is to make the primary DOS partition an active (bootable) partition. Type 2 in the FDISK Options menu and press **Enter**. The display changes to the following:

Change Active Partition

Current Fixed Disk Drive: 1

Partition	Status	Type	Start	End	Size
C: 1		PRI DOS	0	306	307
2		EXT DOS	307	613	307

Total disk space is 614 cylinders.

Enter the number of the partition you
want to make active[]

Press ESC to return to FDISK Options

Type 1 and press **Enter**. This will make the primary DOS partition active.

13. Press **Esc** twice to exit the FDISK command, and the following appears:

System will now restart

Insert DOS diskette in drive A:
Press any key when ready ...

By pressing any key, MS-DOS* will reboot. This is done so as to recognize the hard disk.

14. After the MS-DOS* prompt (A>) appears, execute the **FORMAT** command for hard disk DOS partitions to match the hard disk format with that of MS-DOS*. The following examples assume that your hard disk partitions are drives C and D.

Note: Drive names may shift depending on the options attached to the system. For more information, see Appendices.

CAUTION: All data in the specified drives are destroyed once formatting starts.

Example:

```
A>FORMAT C:/S/V
```

```
WARNING. ALL DATA ON NON-REMOVABLE DISK  
DRIVE C: WILL BE LOST!  
Proceed with Format (Y/N)? Y
```

```
Format complete  
System transferred
```

```
Volume label (11 characters. ENTER for none)? HD1
```

```
A>FORMAT D:/V
```

```
WARNING, ALL DATA ON NON-REMOVABLE DISK  
DRIVE C: WILL BE LOST!  
Proceed with Format (Y/N)? Y
```

```
Format complete
```

```
Volume label (11 characters, ENTER for none)? HD2
```

When formatting is completed, the available memory capacity is displayed and the system returns to MS-DOS*.

15. Now confirm whether MS-DOS* starts up automatically from drive C by either turning the computer off and then on again, or by restarting it by pressing the **Del** key while holding down the **Ctrl** and **Alt** keys at the same time. When you do this, make sure drive A is not locked, because the computer attempts to load MS-DOS* from drive A if drive A is locked.

File Transfer to Hard Disk

This section explains how to transfer files from a diskette to the hard disk. In the following example, the contents of the MS-DOS* diskette are transferred.

1. Insert the MS-DOS* diskette in drive A.
2. Type `COPY A: *. * C: *. *` and press the **Enter** key to duplicate all files stored on the MS-DOS* diskette.

With this, the contents of the MS-DOS* diskette are completely duplicated on the hard disk.

Making Backup Copy of Hard Disk

The hard disk can store a number of programs and a great quantity of data. However, since it is possible to destroy the data by dropping or otherwise damaging the disk, Sharp recommends that you make a backup copy of the hard disk.

Procedures for making a backup copy of all files stored in the MS-DOS* area of the hard disk are explained below.

1. Determine the total size of the files that you want to copy. The number of diskettes necessary for backup is calculated as follows:

$$(\text{Hard disk total capacity}) / (\text{Floppy diskette capacity})$$

For example you need about 30 blank diskettes to back up the 20 Mb of information ($20480/720 \approx 29$).

2. Format all blank diskettes using the **FORMAT** command. As you format them, place labels numbered from 1 to XX on these diskettes.
3. Start up MS-DOS* using the MS-DOS* diskette and enter the following when the MS-DOS* prompt (**A>**) is displayed.

BACKUP C: A:

Then press the **Enter** key. The following message appears:

```
Source disk is Non-removable  
Insert backup diskette 01 in drive A:  
Warning! Files in the target drive  
A: \ root directory will be erased  
Strike any key when ready
```

Insert diskette No. 1 in drive A and press any key to start the backup operation.

4. When the available area in the inserted diskette becomes full, the message shown in step 3 reappears, this time asking for diskette No. 2. When this occurs, remove diskette No. 1 and insert blank diskette No. 2 in drive A. Then, press any key to continue.
5. When you have completely copied all files on the hard disk, the system returns to MS-DOS*, indicating the backup operation has terminated. Be sure to keep your backup diskettes in a safe place.

Restoring Contents of Hard Disk

Procedures for restoring contents of the hard disk using the backup diskettes are described below.

1. Start up MS-DOS* using the MS-DOS* diskette and enter the following when the MS-DOS* prompt (A>) is displayed:

RESTORE A: C:/P

Then press the **Enter** key. The following message appears:

Target is Non-Removable

Insert backup diskette 01 in drive A:
Strike any key when ready

Insert diskette No. 1 in drive A and press any key to begin the restore operation.

CAUTION: If you have updated files on the hard disk, the backup files will no longer be the same. If you choose to restore the backup file, your updated file will be destroyed.

2. When the contents of backup diskette No. 1 have been completely transferred to the hard disk, the message in step 1 reappears, this time asking for backup diskette No. 2. Repeat the restore operation for this and the rest of the backup diskettes.
3. After all files have been transferred from the backup diskettes, the MS-DOS* prompt (A>) is displayed.

System Restarts

In certain instances, you may want to return the system to its start-up state — with only MS-DOS* in memory. For example, this can be used when a new application program diskette is inserted in drive A.

This procedure is called restart (sometimes called “warm boot”).

CAUTION:

Any information in main memory will be lost when this procedure is performed. Save your data and exit from any application first.

To perform this procedure, press and hold down the **Ctrl**, **Alt**, and **Del** keys simultaneously, then release. The system reacts as if power was just turned on, except that it bypassed an internal check.

If your system has no hard disk and there is no diskette in drive A or if the diskette in drive A does not contain MS-DOS*, the system displays an error message similar to this:

```
Loading A: ...  
Loading B: ... Error!  
  
Diskette Drive Empty...  
Please Insert a System Disk and Press any Key:_
```

If this occurs, insert a diskette containing MS-DOS* in drive A, then press any key.

The system can be restarted under most operating conditions.

If a situation occurs where you are unable to restart the system with this procedure, turn power off to the computer, wait five seconds, then turn power on, or perform a compulsory system off by pressing **Ctrl/Alt/Set Up**.

Note: Setting dip switch 1 on the bottom of the unit to the ON and then OFF position is an alternate procedure that requires resetting the set up menu. See Chapter 3 for further information.

Set Up Functions

The computer allows you to customize the configuration of your system through the functions on the set up screen.

Note: This screen provides an alternative to the MS-DOS* DATE, TIME, and MODE commands.

Accessing Set Up

Once your system is turned on, you can access these configuration settings by pressing the **Set Up** key located in the upper left corner of the keyboard.

Note: When you are running an application, the set up function may not be accessible. If this occurs, exit the application, then press **Set Up**. In some rare cases, the application will not accept the settings specified by the set up function.

Here's what the standard set up screen looks like:

SHARP PERSONAL COMPUTER SYSTEM SET-UP MENU (Version x.xx xx/xx/xx)		
----- Clock ----- Time: 03:16:54 Date: Sat March 21, 1987	---Communication--- COM1: Standard SIO COM2: Not Present	----- Printer ----- Interface: Parallel Port Address: 3BCh
----- Power ----- On Condition: None	-COM1: Standard SIO- Baud Rate: 1200 Data Bits: 8 Stop Bits: 1 Parity: None	----- System ----- Speed: Standard Key Click: Off Console: CGA Drive A: Internal 3.5" Font Set: General
----- Display ----- Display Mode: Graphics Cursor Blink: 2/second Cursor Type: Underline Character Blink: 1/second Background: Standard Backlight: On Backlight Timeout: 2 minutes		----- Hard Disk ----- Motor Off: 2 minutes Default Setup: F1
1. Position cursor using cursor keypad	2. Press Spacebar to change	3. Press Set Up key to Update and Exit

This screen displays eight set up function categories – clock, power, display, communication, standard SIO, printer, system, and hard disk – with the default settings for each field. Default means the setting that the system assumes unless you tell it otherwise.

If you have installed the CE-451B serial I/O card, or CE-451A CRT adaptor, additional categories display. See Chapter 6 for more information about these settings.

Making Selections

When you first access this screen after turning on the computer, the cursor is positioned in the first field. There are several ways to move the cursor from field to field on this screen.

To move forward through each field, use the **Right Arrow** or **Down Arrow** key. To move backward through each field, use the **Left Arrow** or **Up Arrow** key.

Once you are in a field, press the **Space Bar** to cycle through the possible settings for the field. Once the desired setting appears, go to another field or press **Set Up** to exit the screen.

If you change any settings, then decide you want to return all fields to their default settings, press the **F1** key. The system then restores all fields, except date and time, to their default settings.

When you press **Set Up** to exit the screen, the system saves your entries.

If you changed a setting that requires system restart, the system prompts you to press **Enter** after pressing the **Set Up** key.

When you press **Esc**, the system exits the set up screen without saving your entries.

Note: A limited number of keys are active in the set up screen. A beep will sound if you press any key other than those described above.

The set up screen is backed up by lead battery. All selections are maintained even when power is turned off. If the system is stored for an extended period of time, however, it may be necessary to reset the values. For recharging battery, see "AC Adaptor Connection" in Chapter 3.

The following is a description of each field.

Clock

The computer contains a battery operated clock that keeps track of the time and date. When you first purchase the system, the current time and date must be set.

Time. This field is divided into three parts — hours, minutes, and seconds. Time is set in a 24-hour clock format. For example, 6 p.m. would be 18 hours.

Date. This field is divided into three parts — month, day, and year. The day of the week (i.e., Mon, Tue, Wed, etc.) is set automatically after the month, day, and year have been entered.

Note: This is equivalent to entering the DATE and TIME commands in MS-DOS*.

Power

This category contains the setting for power control. Power is usually turned on and off by pressing the ON/OFF button provided at the right side panel.

If you select Alarm in the On Condition field and specify time in the next field, power is automatically turned on to the computer when the specified time comes.

On Condition. The possible settings are: None or Alarm.

Alarm Time. This field appears when you select Alarm in the On Condition field. Specify the alarm time in the same format as Time in the Clock category.

Display

This category contains the settings that control the screen. These settings have no effect on a CRT connected to the system except for the cursor type.

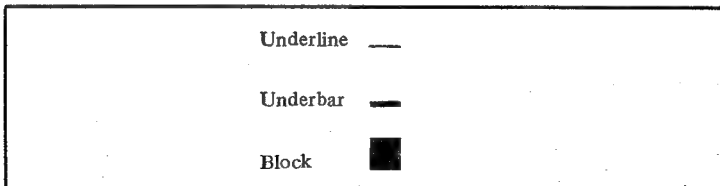
Display Mode. Certain applications require the screen to operate in graphics or monochrome mode. The display mode can be set to emulate a color/graphics adaptor or monochrome adaptor.

The possible settings are: Graphics, or monochrome.

Note: Display mode only controls the computer's screen — it does not control a CRT connected to the system. For the mode setting for a CRT, see Chapter 6.

Cursor Blink. The cursor blink rate is the number of times per second that the cursor blinks on the screen. Possible settings are: No Blink, 1/second, 2/second, or 4/second.

Cursor Type. The cursor's appearance can be changed. The possible settings are: Underline, Underbar or Block.



Character Blink. Some applications cause characters to blink on the screen. For example, in word processing, an entire word might blink if it is spelled incorrectly. The possible settings are: 1/second, 2/second, or 4/second.

Background. The screen background can be set to display in standard — dark characters on a light background — or inverse — light characters on a dark background. The possible settings are: Standard or Inverse.

Backlight. The screen's backlight can be turned on or off. The possible settings are: On or Off.

Backlight Timeout. After a certain period in which no keys are pressed, the system automatically shuts off the backlight. You can determine the approximate length of this timeout period or allow the backlight to stay on continuously. The possible settings are: Always On, 2 minutes, 5 minutes, or 10 minutes.

Communication

This category contains the settings allowing you to define the use of COM1, COM2: communication ports for the standard SIO, the internal modem or internal SIO.

The setting for the standard SIO (COM1 or COM2) appears in the next category.

Baud Rate. The possible settings are: 110, 150, 300, 600, 1200, 2400, 4800, or 9600.

Data Bits. The possible settings are: 7 or 8.

Stop Bits. The possible settings are: 1 or 2.

Parity. The possible settings are: None, Even, or Odd.

Note: If you install the optional CE-451B serial I/O card, an additional category appears below the standard SIO category. For this setting, see Chapter 6.

Printer

This category defines the settings for printers used with your computer.

Interface. Industry standard printers can be connected to either the parallel or serial port. If a printer is connected to the parallel port, select parallel. If a printer is connected to the serial port, select serial. The possible settings are: Serial or Parallel.

Port address. The port address parameter allows you to change the printer port address to match the address used by your software application. In the vast majority of applications, the default address, 3BCH should be used.

3BCH: Represents the port address of the parallel port on the IBM* monochrome display and printer adaptors. This address is used by most applications.

378H: Represents the address of another parallel port. Some applications may be written to directly address this port. Try this address when your application does not address the default port address.

System

There are five miscellaneous fields in this category.

Speed. This field determines the speed of the processor. The standard processor can run at the faster 10 MHz or at a slower speed required by some applications. The possible settings are: Standard or Slow.

Key Click. This field is for click On/Off setting. If this setting is ON, you hear a click whenever you press any key. The possible settings are: On or Off.

Console. This field determines which display type becomes the system console upon boot when the optional CRT adaptor is attached.

Since the liquid crystal display or the CRT can be either monochrome or color graphics, this selection tells the system which display should be the console. The display console can also be changed by using the MODE command. The possible settings are: CGA (color graphics adaptor) or MDA (monochrome display adaptor).

Note: The set up screen appears only on the console which is in the same display mode as specified in this field.

Drive A. This field is used to assign Floppy Disk Drive A to Internal 3-1/2" FDD or External 5-1/4" FDD. If External 5-1/4" is selected, DOS can be run from 5-1/4" diskette. The possible settings are: Internal 3.5" or External 5.25".

Font Set. This field is used to determine the computer's internal font set. The possible settings are General or Denmark/Norway.

Hard Disk

Motor Off. After a certain period with no access to the hard disk, the spindle motor power of the hard disk is automatically turned off. You can determine the settings are: Always On, 2 minutes, 5 minutes or 10 minutes.

Default. If you change any fields on this screen, then decide you want to return all entries to the default values, press the F1 key in any field. Time and date are not affected.

Running an Application

The computer allows you to run a wide variety of application software. This section provides a general overview of the steps involved in installing and running an application on the system.

In general, application software must be installed before it can be used. Installation procedures vary greatly from one application to another depending upon such factors as software copy protection, hardware options, etc.

In order to properly install a specific application, follow the instructions provided with the software.

To illustrate a typical session, we will describe sample procedures for running a word processing application. These steps provide a conceptual overview only.

Note: MS-DOS* commands that are discussed in this chapter are described in more detail in Chapter 5.

Getting Started

In this example, the word processor is supplied on two diskettes:

- ▲ Master word processing diskette
- ▲ Master spell checker diskette

The master word processing diskette contains the word processing software. The master spell checker diskette contains the spell checker software. Since neither of these diskettes contain MS-DOS*, they could not be used to start up — or boot — the system.

The steps to follow when installing an application on floppy diskettes and on the hard disk are substantially different.

Using Two Disk Drives (PC-4602)

Before running our example word processor, two steps must be completed:

1. Create boot diskettes.
2. Create data diskettes.

Create Boot Diskettes. We need to create two new diskettes. One diskette will contain MS-DOS* plus the word processing software. The other will contain MS-DOS* plus the spell checker software.

The following is an example of how to create a boot diskette.

1. Insert your working copy of MS-DOS* in drive A and a blank (or re-usable) diskette in drive B.
2. Turn power on to the system. (If the power is already turned on and you are in MS-DOS*, you can press **Ctrl/Alt/Del** to restart the system.)
3. Once the MS-DOS* prompt appears (**A>**), enter the command shown below:

```
A>FORMAT B:/S
```

This will format and copy MS-DOS* to the blank diskette in drive B.

4. Remove the MS-DOS* diskette in drive A and replace with the master word processing diskette.
5. Enter the command shown below.

```
A>COPY A:*. * B:
```

This will copy all the files from the diskette in drive A to the target diskette in drive B.

6. Once this process is completed, remove the diskette and label it as the word processor boot diskette.

The same process would be followed for creating the spell checker boot diskette.

The boot diskettes are now created. In the process, the master diskettes can now be stored in a safe place as backups.

Create Data Diskettes. There is one last step to perform before the application can be used. A data diskette needs to be created for the permanent storage of files created in word processing.

The following is an example of how to create a data diskette.

1. Insert your working copy of MS-DOS* in drive A.
2. Insert a blank (or re-usable) diskette in drive B.
3. Enter the command shown below.

```
A>FORMAT B:
```


This prepares — or formats — a blank diskette in drive B to store files created by the word processor.

Using the Hard Disk (PC-4641)

It is assumed you have already prepared the hard disk for use. If not, prepare it referring to “Preparing the Hard Disk for Use” in the “System Start-up” section in this chapter.

Before describing how to install the application on the hard disk, we must discuss the concept of “directory”.

A directory is a group of files. At the time of power on, you are in the directory called “root directory”. You can create subdirectories under the root directory, and also you can create subdirectories under each subdirectory. In this way, you can construct a “tree” structure of directories on a diskette or hard disk.

Directories are convenient when you have a lot of files and want to store them into several groups. For details, see chapter 5.

The following is an example of how to install an application in a subdirectory on the hard disk.

1. With no diskette in drive A, turn power on to the system. (If the power is already turned on and you are in MS-DOS*, you can press **Ctrl/Alt/Del** to restart the system with no diskette in drive A.)
2. Once the MS-DOS* prompt appears (C>), enter the command shown below:

Note: When using the external floppy disk drive, the MS-DOS* prompt will be “D>”.

```
C>CHDIR
```

This command takes you back to the root directory if you are not there so that you can create a subdirectory for the application under the root directory. Please note that “\” means the root directory.

3. Next, enter the command shown below:

```
C>MKDIR WP
```

This will make a subdirectory named “WP” under the root directory.

4. Enter the command shown below:

```
C>CHDIR WP
```

This will take you to the new subdirectory “WP”.

5. Insert the master word processing diskette in drive A. Then enter the command shown below:

```
C>COPY A:*.*
```

This will copy all the files from the diskette in drive A to your current hard disk directory, \WP.

The same process would be followed for creating the spell checker boot diskette.

The word processing application is now installed on the hard disk. In the process, the master diskettes can now be stored in a safe place as backups.

The data files can be created on the hard disk, so you need not create a data diskette.

Using the Application

Using Floppy Disk Drives

You now are ready to use the application.

Suppose you now want to write a memo to your sales staff on the word processor. Here's what to do.

1. Insert the word processing boot diskette in drive A.
2. Insert the data diskette in drive B.
3. If the system's power has been turned off, turn on the power.
4. Once MS-DOS* is loaded from the boot diskette in drive A, you can enter a command — defined by the system — to start the application. In our example, this command is the following:

```
A>WF
```

The application is then read into main memory. Once fully loaded, the application software displays on the screen. You can then follow the application software's documentation to complete the desired task — in this case, create a memo.

Once the memo is created, it is saved through the application onto a data diskette in drive B. The memo can then be printed, retrieved for future editing, or sent via the modem to another computer.

When finished with the word processor, the system returns you to MS-DOS* where you can load another application, use MS-DOS* commands, or remove the diskettes and turn off the system.

Using the Hard Disk

1. With no diskette in drive A, turn on the power.
2. Once MS-DOS* is loaded from the hard disk, you can change the directory to the one you have created for the application. In our example, enter as follows:

```
C>CHDIR WP
```

3. Enter a command defined by the system to start the application. In our example, this command is the following:

```
C>WP
```

The application is then read into main memory. Once fully loaded, the application software displays on the screen. You can then follow the application software's documentation to complete the desired task — in this case, create a memo.

Once the memo is created, it is saved through the application in the data file in the hard disk. The memo can then be printed, retrieved for future editing, or sent via the modem to another computer.

When finished with the word processor, the system returns you to MS-DOS* where you can load another application, use MS-DOS* commands, or turn off the system.

Backing Up Data

- **Using Floppy Disk Drive**

When important files have been created on a data diskette, the diskette should be copied to insure that data is not lost if something should happen to the diskette.

This process is called backing up your data. It is performed by using the DISKCOPY command. See Chapter 5 for more information about this command.

- **Using the Hard Disk**

When important data files have been created on the hard disk, they should be copied onto a diskette to insure that data is not lost if something should happen to the hard disk.

This process is called backing up your data. It is performed by formatting a blank diskette using the FORMAT command and then backing up the files using the BACKUP command. See chapter 5 and the optional MS-DOS* manual for more information about these commands.

Device Indicator

When installing applications software, you may be asked to identify the type of hardware being used. If specific selections for this computer are not listed, you may select other hardware settings that provide similar features. Use the following guidelines when making these selections:

Display. When identifying the display, select IBM* color/graphics adaptor mode (when in Graphics mode) or IBM* monochrome display adaptor mode (when in Monochrome mode).

Keyboard. When identifying the keyboard, select IBM* PC layout.

Optional Color Monitor. When identifying the color monitor, select IBM* color graphics adaptor 640 x 200 two-color black and white mode or 320 x 200 four-color mode.

Optional Monochrome Monitor. When identifying the monochrome monitor, select IBM* monochrome display adaptor mode.

In some cases, more than one suitable selection may be available. It may be necessary to experiment with these settings to determine the best choice.

Operating Addendum

In a limited number of cases, when installing or running application software, it may be necessary to follow some special operating procedures.

The following guidelines are supplied for your use.

System Files on the MS-DOS* diskette. In certain cases it may not be possible to transfer the system files from the MS-DOS* diskette onto a program diskette using the SYS command. If this occurs, do not attempt to create a bootable diskette; instead, load the MS-DOS* diskette in drive A then remove, and place the program diskette in drive A.

Cursor Type and Blink Rate. The computer allows you to select underline, underbar, or block cursor types as well as cursor blink rate for the illuminated crystal display. Certain application software, however, does not support changes to cursor type or blink rate and will either ignore those settings in the set up menu or cause unpredictable results on the display.

Aspect Ratio. Graphics, e.g., a circle, on the CRT display will appear slightly elongated in the horizontal direction when displayed on the illuminated crystal display. This is because the aspect ratio of the illuminated crystal display differs from that of the CRT display.

System Reaction When Running Application. In some rare cases when running certain application programs, the ON/OFF button and/or the key lock indicators may react slowly. If the ON/OFF button does not function at all, return to MS-DOS*, then press the button again. If the problem continues, execute the system off by pressing the **SetUp** key while holding down the **Ctrl** and **Alt** keys.

More on MS-DOS*

Overview

5-1

Files

5-3

Keyboard Usage

5-7

MS-DOS* Prompt

5-9

MS-DOS* Commands

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Overview

This chapter is an introduction to the operating system software — MS-DOS*. It provides you with enough information to perform basic MS-DOS* file management activities. For more complete description of MS-DOS*, see the optional MS-DOS* manual.

The first section describes the role of files in MS-DOS*.

The second section defines some basic keyboard rules when using MS-DOS*.

The third section describes the MS-DOS* prompt.

The fourth section describes some common MS-DOS* commands.

Files

In addition to managing system resources, the MS-DOS* operating system manages files created on the computer.

What are Files?

A file is related information created on the computer and saved on a diskette or hard disk for future use.

Typically, files are created through the use of application programs. For example, in a word processing application, you may create a file that contains a letter to prospective clients. Similarly, a spreadsheet application may be used to create a cash flow analysis.

Files created through applications are usually referred to as data files since they contain information — or data.

How are Files Used?

Once a file is created, it is identified by a file name and saved on a floppy diskette or hard disk.

At a later time, the file can be retrieved and edited to reflect changes, sent to the printer to create a paper copy, or sent to the modem for transmission to another computer via telephone lines.

For the most part, you create, name, save, and retrieve files through the application software which actually instructs MS-DOS* to perform these tasks.

Certain file management activities are handled directly through MS-DOS*. For example, suppose you have saved several spreadsheets on a diskette, and now want to make a copy of the diskette for backup. The MS-DOS* command DISKCOPY is used to perform this task.

Naming Files

Files must be identified by a unique name before they can be saved on a diskette or hard disk. Let's cover a few important MS-DOS* requirements for naming files.

First, a file name generally has two parts — the name and the extension.

The name typically identifies the file. For example, MEMO could be the name of a word processing file containing a memo.

The extension typically categorizes the file. For example, the MEMO file might have the extension DOC to indicate that the file is a document. The file extension is optional; however, it is useful for identifying files in the same category.

The name and extension are separated by a period (e.g., MEMO.DOC). If an extension is used, it becomes a permanent part of the file name.

The name can be up to eight characters and the extension up to three characters.

Note: All files stored in the same directory on a diskette or hard disk must have unique names.

Acceptable Characters. The following are acceptable characters in file names:

Any letter in the alphabet. MS-DOS* makes no distinction between upper and lower case, so either case is acceptable.

Numerals (i.e., 0 through 9)

Punctuation marks as follows:

! @ # % & ^ () - _ ' { } ~

Unacceptable Characters. Characters other than those shown above are unacceptable characters in a file name. For example, commas, double quotation marks, and spaces are not acceptable.

Note: Remember, extensions begin with a period, so be careful where you use them.

Saving Files

When a file is saved on a diskette, information about the file is stored in the directory. Information such as the file name, size (number of bytes), and date last updated appears in the directory.

When files are added, deleted, or renamed, the directory is automatically updated to reflect the current status of the diskette (see DIR command).

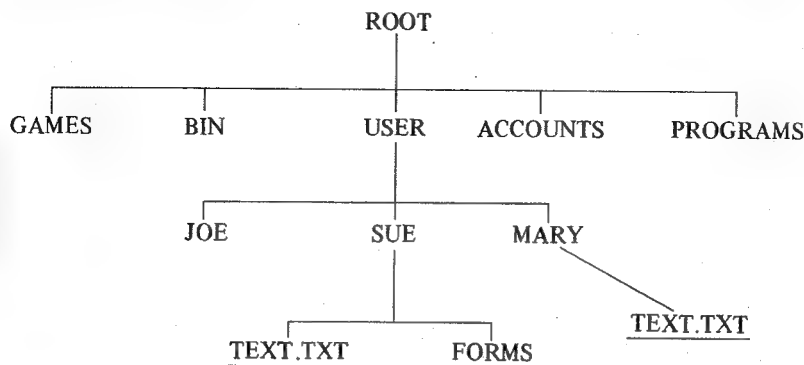
Directory

A directory is a group of files. At the time of power on, you are in the directory called "root directory". You can create subdirectories under the root directory, as well as subdirectories under each subdirectory using the MKDIR command. In this way, you can construct a "tree" structure of directories on a diskette.

You can "travel" around this tree; for example, you can find any file in the system by starting at the root directory and traveling down any of the subdirectories to the desired file, or vice versa.

The directory you are in is called "working directory". You can change your working directory to any directory using the CHDIR command. Unless you take special action when you create a file, the new file is created in your working directory. You can have files of the same name in different directories.

The illustration below shows a typical tree structure of directories.



Note: Those with underline are files.

To identify a file in a different directory from your working directory, specify the file name following each directory name from the root directory.

For example, if you want to identify the TEXT. TXT file in the MARY directory, specify,

`\USER\MARY\TEXT. TXT`

This name, optionally preceded by the drive specifier, is called “pathname”, and the pathname which contains no file name is called “path”.

Notice each directory name is separated by back slash (\).

Keyboard Usage

When MS-DOS* is in effect, the keyboard functions as described below.

Enter. This key is used to send a command to the operating system. Always remember to press **Enter** once you have typed the command.

Esc. This key is used to cancel a line. If you have typed a command incorrectly and want to start over, press **Esc**. The command is then cancelled and a backslash appears on the cancelled line.

Backspace. This key moves the cursor backwards, erasing one character at a time. If you discover a typing error while typing a command, press **Backspace**, then re-type the command.

Ctrl/Scroll Lock. Pressing **Scroll Lock** while holding down **Ctrl** stops a command that is currently being processed. Sometimes called "Break", this key is used to abort a program that is running on the system. **Ctrl/C** performs the same function except that it is ineffective if some key is pressed before **Ctrl/C**.

Ctrl/NumLock. Pressing **NumLock** while holding down **Ctrl** stops the display of data on the screen. To continue displaying, press any key. **Ctrl/S** performs the same function except that it is ineffective if some key is pressed before **Ctrl/S**.

PrtSc. This key is used to send information to the printer in MS-DOS*. To print what appears on the screen, press **PrtSc** while holding down **Shift**. (Be sure the printer is connected before you use **PrtSc**.) To print a line every time you press **Enter**, press **Ctrl** and **PrtSc** together. To stop printout, press **Ctrl/PrtSc** again.

F1 or →. This key copies and displays one character from the retained line.

F2. This key copies and displays all characters up to (not including) the specified character.

F3. This key copies all remaining characters from the retained line.

F4. This key skips all characters in the retained line up to (not including) the specified character.

F5. This key accepts the new line as a retained line for more editing.

F6. This key puts a **Ctrl/Z** (^Z) end-of-file character.

Del. This key skips one character in the retained line.

Ins. This toggle key enters and exits the insert mode as it is pressed.

Note: On most typewriters, number one (1) and the lower case letter "l" can be used in place of each other. The same applies to zero (0) and the letter "O." On the computer, however, these keys have unique meanings and must be used appropriately.

MS-DOS*

Prompt

Since you will be working with both the operating system and application software, you need to recognize when MS-DOS* is in effect.

Under MS-DOS*, the system displays the prompt like this:



A>

There are three typical ways to get to the MS-DOS* prompt:

- ▲ System start-up
- ▲ Exit an application
- ▲ System restart

System Start-up. When you turn on the system with an MS-DOS* diskette in drive A or with MS-DOS* on the hard disk, the MS-DOS* prompt is displayed after the software is loaded into main memory.

Exit an Application. When you exit an application such as word processing, you are returned to MS-DOS*.

System Restart. Pressing **Ctrl/Alt/Del** clears main memory and re-loads MS-DOS*. Remember, you could lose data if you perform this step without first saving your file.

Drive Specifier

The MS-DOS* prompt also identifies the current default disk drive. Look at the following example.

```
A>
```

The “A” tells you that the default drive is drive A. In other words, unless instructed otherwise, all reading and writing will be done to drive A. If you wanted to delete a file on the diskette in drive A, you would only need to enter the MS-DOS* command and the file name as shown in the example below.

```
A>DEL BUDGET.DOC
```

The operating system will look for the file “BUDGET.DOC” on the diskette in drive A. But what if the file is on another drive? You have two options – you can specify the drive location as part of the command or you can change the default drive to the one you like before issuing the command.

For users of the PC-4602

The example below shows how you would include the drive location as part of the command.

```
A>DEL B:BUDGET.DOC
```

The “B:” tells MS-DOS* to look for the file “BUDGET.DOC” on the diskette in drive B.

The example below shows how to change the default to drive B before entering the command to delete the file.

```
A>B:  
B>DEL BUDGET.DOC
```

First, "B:" is entered to change the default drive from A to B. Notice how the prompt on the second line is "B>". Once the default has been specified, the command can be entered without the drive being specified.

For users of the PC-4641

The example below shows how you would include the drive location as part of the command.

```
C>DEL A:BUDGET.DOC
```

The "A:" tells MS-DOS* to look for the file "BUDGET.DOC" on the diskette in drive A.

The example below shows how to change the default to drive A before entering the command to delete the file.

```
C>A:  
A>DEL.BUDGET.DOC
```

First, "A:" is entered to change the default drive from C to A. Notice how the prompt on the second line is "A>". Once the default has been specified, the command can be entered without the drive being specified.

You can also specify drive B as a conceptual drive. At this time, A: and B: represent "drive A diskette" and "drive B diskette". This function is convenient when using the COPY command or the FC command in the single-drive system.

For example:

```
C>COPY A:SHARP.DOC B:
```

```
Insert diskette for drive B: and strike  
any key when ready:
```

```
1 File(s) copied
```

For details, refer to Appendix A in the optional MS-DOS* manual.

Note: If you are using the optional CE-452F external floppy disk drive with your computer, you cannot use logical drive B.

MS-DOS*

Commands

Below is the list of command names contained on the diskettes. Use this as a quick reference to determine the command you want to use.

APPEND	Sets a search path for data files
ASSIGN	Drive assignment
ATTRIB	Sets or displays file attributes.
AUTOEXEC	Automatic program execution
BACKUP	Backs up one or more files from one disk to another.
BASIC	GW-BASIC system loader
BASICA	GW-BASIC system loader
BREAK	Set Ctrl/C check
CHCP	Displays or changes the current code page
CHDIR	Changes directories; prints working directory (CD)
CHKDSK	Scans the default or designated drive and checks disk status
CLS	Clears screen
COMMAND	MS-DOS command processor
COMP	Compares the contents of two files
COPY	Copies file(s) specified
CTTY	Changes console TTY
DATE	Displays and sets date
DEBUG	Debugger
DEL	Deletes file(s) specified (ERASE)
DIAG	Diagnostics program
DIR	Lists requested directory entries
DISKCOMP	Compares diskettes
DISKCOPY	Copies diskettes
EDLIN	Line editor

EXE2BIN	Converts executable files to binary format
EXIT	Exits command and returns to lower level
FASTOPEN	Quickly opens files and directories
FC	Compares files
FDISK	Configures hard disks for MS-DOS*
FIND	Searches for a constant string of text
FORMAT	Formats a diskette to receive MS-DOS files
GRAPHICS	Prints graphics
GRAFTABL	Loads a table of graphics characters.
GW BASIC	GW-BASIC interpreter
HDTRNS	Moves the hard disk heads for transportation
JOIN	Join a disk drive to a specified path
KEYB	Changes keyboard layout
LABEL	Labels a diskette
LINK	Linker
MKDIR	Makes a directory (MD)
MODE	Mode selector
MORE	Displays output one screen at a time
NLSFUNC	Loads country-specific information
PATH	Sets a command search path
PRINT	Background print
PROMPT	Changes the MS-DOS command prompt
RECOVER	Recovers a bad diskette
REN	Renames first file as second file (RENAME)
REPLACE	Replaces previous versions of files
RESTORE	Restores backed up files
RMDIR	Removes a directory (RD)
SELECT	Installs DOS with the country specific information
SET	Sets one string value to another
SHARE	Installs file sharing and locking
SORT	Sorts data alphabetically, forward or backward
SUBST	Substitutes a string for a path name
SYS	Transfers system
TIME	Displays and sets time
TREE	Displays all the paths

TYPE	Displays the contents of file specified
VER	Prints MS-DOS version number
VERIFY	Verifies writes to diskette
VOL	Prints volume identification number
XCOPY	Copys files and subdirectories

BATCH PROCESSING COMMANDS

ECHO	Allows or inhibits the screen display of DOS commands executed from a batch file.
FOR	Allows iterative execution of DOS commands.
GOTO	Transfers control to the appropriate label.
IF	Conditional execution of DOS commands.
PAUSE	Suspends system processing.
REM	Displays remarks from within a batch file.
SHIFT	Allows command lines to make use of more than ten replaceable parameters.

DEVICE DRIVERS

ANSI	ANSI escape sequence device driver
COUNTRY	Loads country-specific information
DISPLAY	Supports code page switching on the console device
DRIVER	Configures installable block device drivers
KEYBOARD	Keyboard definition file
RAMDRIVE	Installs a RAM drive

Syntax

MS-DOS* commands must be entered in a specific sequence and must include certain parameters such as file name and drive designator. The syntax or rules for entering these commands are described below.

Commands always begin with the command name, followed by one blank space. Following the blank space are the parameters for the command. Parameters are additional information you supply with the command.

Two common parameters are file name and disk drive specifier. In command syntax, file name is shown as "filename" and disk drive specifier is shown as "d:".

When you enter the file name, be sure to include the file extension if one exists. When you specify a disk drive, enter the disk drive letter (e.g., A, B, C), followed by a colon.

Some parameters are optional while others are required. Optional parameters are shown in brackets (e.g., [filename]).

The following syntax notation is used in descriptions of commands:

- [] Square brackets indicate that the enclosed entry is optional.
- < > Angle brackets indicate data you must enter. When the angle brackets enclose lowercase text, you must type in an entry defined by the text; for example, < filename >.
- { } Braces indicate that you have a choice between two or more entries. At least one of the entries enclosed in braces must be chosen unless the entries are also enclosed in square brackets.
- ... Ellipses indicate that an entry may be repeated as many times as needed or desired.
- | A bar indicates an OR statement in a command.

Below is the table of syntaxes of command names.

APPEND [**<d:>**] **<path>** [**;** [**<d:>**] [**<path>**] ...]
ASSIGN [**X= Y[...]**]
ATTRIB [**+R|-R**] [**+A|-A**] [**<d:>**] **<pathname>**
AUTOEXEC [**<d:>**] [**<pathname>**] **<command>**
BACKUP [**<d:>**] **<pathname>** **<d:>** [**/S**] [**/M**] [**/A**]
 [**/D:** **<date>**] [**/T:** **<time>**]
BASIC [**<d:>**] [**<pathname>**]
BASICA [**<d:>**] [**<pathname>**]
BREAK [**ON|OFF**]
CHCP [**nnn**]
CHDIR [**<path>**]
CHKDSK [**<d:>**] [**<filename>**] [**/F**] [**/V**]
CLS
COMMAND [**<d:>** **<pathname>**] [**<cttydev>**]
 [**/C** **<string>**] [**/E:** **<nnn>**]
COMP [**<d:>**] [**<pathname1>**] [**<d:>**] [**<pathname2>**]
COPY [**/A**] [**/B**] [**<d:>**] **<pathname>** [**/A**] [**/B**]
 [**<d:>**] [**<pathname>**] [**/A**] [**/B**] [**/V**]
CTTY **<device>**
DATE [**<mm>**]-**<dd>**-**<yy>**]
DEBUG [[**<d:>**] **<pathname>**]
DEL [**<pathname>**] **<filename>**]
DIAG
DIR [**<d:>**] [**<pathname>**] [**/P**] [**/W**]
DISKCOMP [**<d:>**] [**<d:>**] [**/1**] [**/8**]
DISKCOPY [**<d:>**] [**<d:>**] [**/1**]
EDLIN [**<d:>**] **<pathname>**
EXE2BIN [**<d:>**]
EXIT
FASTOPEN **<d:>** [[**=nnn**] [...]]
FC [**/A**] [**/B**] [**/C**] [**/L**] [**/LB<n>**] [**/T**] [**/W**] [**/<NNNN>**]
 <filename 1> **<filename 2>**
FDISK
FIND [**/V**] [**/C**] [**/N**] **<"string">** [**<d:>**] [**<pathname>**]
FORMAT [**<d:>**] [**/1**] [**/4**] [**/8**] [**/B**] [**/S**] [**/V**]
GRAFTABL
GRAPHICS [**<printer>**] [**/R**] [**/B**]


```

GW BASIC [<d:>] [<pathname>]
HDTRNS
JOIN <d:> <d:> <pathname> [/D]
KEYB <keyboard code>
LABEL [<d:>] [<volume name>]
LINK
MKDIR <path>
MODE COM<n>: <baud rate> [, <parity> [, <data bit>
    [, <stop bit> [, P] ]]]
MODE LPT <n> : = COM <m>
MODE LPT <n> : [<chars>] [, [<lines>] [, P]]
MODE <display>
MODE [<display>] , <shift> [, T]
MORE
NLSFUNC [[<d:>] [<path>] <filename>]
PATH [<d:> <pathname>] [<d:> <pathname>] ...]
PRINT [[<d:>] [<pathname>] [/D: <device>]
    [/B: <size>] [/U: <busytick>] [/M: <maxtick>]
    [/S: <timeslice>] [/Q: <value>] [/T] [/C] [/P]
PROMPT [<prompt- text>]
RECOVER [<filename> | <d:>]
REN <filename> <filename>
REPLACE [<d:>] <pathname> [<d:>] [<path>]
    [/A] [/D] [/P] [/R] [/S] [/W]
RESTORE <d:> [<d:>] [<pathname>] [/S] [/P]
RMDIR <d:> <path>
SELECT <country code> <keyboard code>
SET [<string>] = [<string>]]
SHARE [/F: <filename>] [/L: <locks>]
SORT [<d:>] [<pathname>] [/R] [/+n]
SUBST [<d:>] [<pathname>] [/D]
SYS <d:>
TIME [<hh>] [: <mm>]]
TREE [<d:>] [/F]
TYPE [<d:>] <pathname>
VER
VERIFY [ON|OFF]

```

VOL [<d:>]

XCOPY [<d:>] [<pathname>] [<filename>] [<d:>]
 [<pathname>] [<filename>] [/A] [/D:<mm-dd-yy>]
 [/E] [/M] [/P] [/S] [/V] [/W]

BATCH PROCESSING COMMANDS

ECHO [ON|OFF|message]

FOR %% <C> IN <set> DO <command>

– for batch processing

or

FOR % <C> IN <set> DO <command>

– for interactive processing

GOTO <label>

IF [NOT] <condition> <command>

PAUSE [comment]

REM [comment]

SHIFT

EDLIN COMMAND

[<line>]	(Edits line no.)
[<n>] A	(Appends lines)
[<line>], [<line>], <line>	(Copies lines)
[,<count>] C	
[<line>] [,<line>] D	(Deletes lines)
E	(Ends editing)
[<line>] I	(Inserts lines)
[<line>] [,<line>] L	(Lists text)
[<line>], [<line>], <line> M	(Moves lines)
[<line>] [,<line>] P	(Pages text)
Q	(Quits editing)
[<line>] [,<line>] [?] R	(Replaces lines)
[<string 1>] [Ctrl/Z]	
[<string 2>]	
[<line>] [,<line>] [?] S	(Searches text)
[<string>]	
[<line>] T <filename>	(Transfers text)
[<n>] W	(Writes lines)

DEBUG COMMAND

A [<address>]

(Assemble)

C <range> <address>	(Compare)
D [<range>]	(Dump)
E <address> [<list>]	(Enter)
F <range> <list>	(Fill)
G [=<address> [<address>...]]	(Go)
H <value> <value>	(Hex)
I <value>	(Input)
L [<address> [<drive> <record> <record>]]	(Load)
M <range> <address>	(Move)
N <filename> [<filename>]	(Name)
O <value> <byte>	(Output)
Q	
R [<register-name>]	(Register)
S <range> <list>	(Search)
T [=<address>] [<value>]	(Trace)
U [<range>]	(Unassemble)
W [<address> [<drive> <record> <record>]]	(Write)

The rest of this section provides a more detailed description of some of the above commands.

BACKUP

This command is used to back up the files stored on the hard disk onto the floppy diskette(s). You must format the diskette(s) before use.

Example:

```
A>BACKUP C: A:
```

```
Source disk is Non-removable
```

```
Insert backup diskette 01 in drive A:
```

```
Warning! Files in the target drive
A: root directory will be erased
Strike any key when ready
```

```
Backing up files to drive A:
Diskette Number: 01
```

```
SHARP1.DOC
SHARP2.DOC
```

CHDIR

This command changes your working directory to the specified one. You can specify the directory by typing from the root directory (\) or working directory down to the one you like. You must separate directories with the backward slash mark (\). Entering this command without directory name displays the current working directory.

Example:

```
A>CHDIR \WP\SHARP\ABC
```

CHKDSK

This command is used to check and report on the status of the diskette and memory. It scans the directory of the default or specified drive and checks it for any structural errors. Once the diskette has been checked, the system displays any error messages followed by a status report.

Example:

```
A>CHKDSK A:  
Volume SHARP created Nov 24, 1988 9:00a  
  
730112 bytes total disk space  
25600 bytes in 3 hidden files  
1024 bytes in 1 directory  
159744 bytes in 27 user files  
543744 bytes available on disk  
  
262144 bytes total memory  
231152 bytes free
```

COPY

This command copies a file from one diskette to another or onto the same diskette. The /V parameter can be included to instruct the system to verify the copy was successful.

Example:

```
A>COPY MEMO.DOC B:MEMO.85
1 File(s) copied
```

Note: All files in the same directory must have a unique name. When copying a file in the same directory, rename the copy.

```
A>COPY MEMO.DOC NEWMEMO.DOC
1 File(s) copied
```

DEL

This command deletes files that are no longer needed from the diskette. The process removes the file name from the directory and makes space available for new files.

CAUTION:

Use this command only when you are certain you want to delete the file. Data is lost once this command is used.

Example:

```
A>DEL MEMO.DOC
```

DIR

This command lists file names, file sizes, and date files were last updated. If a file name is not specified, all directory entries on the diskette in the default drive display. The parameter /P can be added to cause the system to pause once a screen is full. Press any key to continue. The parameter /W can also be added to list only file names in five columns across the screen.

Example:

```
A>DIR

Volume in drive A has no label
Directory of A:\

COMMAND  COM      15957      8-01-85 12:00p
AUTOEXEC BAT        26      7-26-86 12:07a
CONFIG   SYS        27      4-28-87  1:59p
BIN      directory    7-26-86 12:00a
          4 File(s)  543744 bytes free
```

DISKCOMP

This command compares one diskette to another on a track-by-track basis. If any tracks are unequal, error messages are issued.

Example 1 (PC-4602)

```
A>DISKCOMP A: B:

Insert FIRST diskette in drive A:

Insert SECOND diskette in drive B:

Press any key when ready ...

Comparing 80 tracks
9 sectors per track, 2 Sides

Compare OK

Compare another diskette (Y/N)?
```

Example 2 (PC-4641)

```
A>DISKCOMP A: A:

Insert FIRST diskette in drive A:

Press any key when ready

Comparing 80 tracks
9 sectors per track, 2 Sides

Insert SECOND diskette in drive A:

Press any key when ready

Insert FIRST diskette in drive A:

Press any key when ready

Compare OK

Compare another diskette (Y/N)?
```

DISKCOPY

This command copies all files on one diskette to another. If a new diskette is used as the destination diskette, DISKCOPY automatically formats the diskette before copying, if the diskette has not been previously formatted.

Example 1 (PC-4602)

```
A>DISKCOPY A: B:
Insert SOURCE diskette in drive A:
Insert TARGET diskette in drive B:
Press any key when ready ...
Copying 80 tracks
9 Sectors/Track, 2 Sides
Formatting while copying
Copy another diskette (Y/N)?
```


Example 2 (PC-4641)

```
A>DISKCOPY A: A:
```

```
Insert SOURCE diskette in drive A:
```

```
Press any key when ready ...
```

```
Copying 80 tracks  
9 Sectors/Track, 2 Sides
```

```
Insert TARGET diskette in drive A:
```

```
Press any key when ready ...
```

```
Formatting while copying
```

```
Insert SOURCE diskette in drive A:
```

```
Press any key when ready ...
```

```
Insert TARGET diskette in drive A:
```

```
Press any key when ready ...
```

```
Copy another diskette (Y/N)?
```

FC

This command compares individual files on the same diskette or different diskettes on a byte by byte basis. Any unequal bytes result in error messages. It is frequently used after copying to verify that the copy was successful.

Example:

```
A>FC MEMO.DOC B:MEMO.DOC
```

FORMAT

This command prepares a diskette for use with MS-DOS*. In addition, this command checks for defective tracks on the diskette. The /S parameter can be added to copy the internal operating system programs after formatting the diskette.

CAUTION:

FORMAT will erase any files stored on the diskette.

Note: The DISKCOPY command formats a diskette as part of the copy operation, if the diskette has not been previously formatted.

```
A> FORMAT A:/S/V
Insert new diskette for drive A:
and strike ENTER when ready

Format complete
System transferred

Volume label (11 characters, ENTER for none)? SALESREP

XXXXXXX bytes total disk space
XXXXXX bytes used by system
XXXXXXX bytes available on disk

Format another (Y/N)? _
```

MKDIR

This command makes a new directory at the location and with the name you specify.

Example:

```
A>MKDIR \WP\SHARP\ABC
```

RENAME

This command changes the name of existing files.

Example:

```
A>REN MEMO.DOC LETTER.DOC
```

RESTORE

This command restores data backed up on the floppy diskette(s) onto the hard disk. Notice that you can restore only the files backed up with the BACKUP command and cannot restore the other files.

Example:

```
C>RESTORE A: C:

Target is Non-Removable

Insert backup diskette 01 in drive A:
Strike any key when ready

***Files were backed up on 8/8/1988***

Restoring files from drive A:***
Diskette: 01

\SHARP1.DOC
\SHARP2.DOC
```

TYPE

This command displays the contents of a file.

Example:

```
A>TYPE SALESRPT.DOC
```

Once the command is entered, the system then displays the file contents. If you need to stop a file as it displays on the screen, use **Ctrl/NumLock**.

Global Commands

Global commands are commands that are carried out on a group of related files.

Instead of specifying a specific file name to be copied, deleted, renamed, etc., all file names in a given category can be specified. Two characters, the question mark (?) and the asterisk (*), are used as wild cards when specifying file names.

Let's look at the ? character first. The example below shows how the ? character can be used to mask one character in the file name.

```
A>DEL BUDGET.??
```

The ? character means that any character may occupy the ? position in the file name. All other characters in the file name must match.

In this example, the files BUDGET.77, BUDGET.78, and BUDGET.79 would all be deleted. The file BUDGET.80 would not be deleted.

Let's look at the * character. The example below shows how the * character is used to mask many characters in the file name.

```
A>DIR *.DOC
```

The * character, when used as part of a file name, means that any characters can occupy the position of the *, and the remaining positions up to the file extension.

In this example, the files MEMO.DOC, LETTER.DOC, and SALES.DOC would display in the directory. In other words, all file names with the extension .DOC would display.

Note: Using *. * in a command means all files are affected.

CAUTION:

Although global commands are time savers, they should be used carefully, especially with DEL. Entering a sequence such as DEL *. * would delete all files on the diskette.

Automatic Program Execution

If you want to run a specific program automatically each time you start MS-DOS*, you can do so with Automatic Program Execution.

When you start MS-DOS*, the command processor searches for a file named AUTOEXEC.BAT on the MS-DOS* diskette. This file is a program that MS-DOS* will run each time MS-DOS* is started.

If MS-DOS* finds the AUTOEXEC.BAT file, the file is immediately executed by the command processor and the date and time prompts are bypassed.

If MS-DOS* does not find an AUTOEXEC.BAT file when you first load the MS-DOS* diskette, then the date and time prompts will be issued.

Example:

If you wanted to automatically display the directory of the diskette in drive A each time you started MS-DOS*, you could create an AUTOEXEC.BAT file as follows:

Note: The MS-DOS* diskette provided with the computer contains important data in the AUTOEXEC.-BAT file. Since the example below destroys the original AUTOEXEC.BAT file, use a diskette which does not contain an AUTOEXEC.BAT file.

1. Type:

COPY CON AUTOEXEC.BAT

and press **Enter**.

This statement tells MS-DOS* to copy the information from the console (keyboard) into the AUTOEXEC.BAT file.

Note that the AUTOEXEC.BAT file must be created in the root directory of your MS-DOS* diskette.

2. Now type:

DIR

and press **Enter**.

This statement goes into the AUTOEXEC.BAT file. It tells MS-DOS* to display the directory whenever MS-DOS* is started.

3. Type **Z** while holding down the **Ctrl** key and then press the **Enter** key to put the command **DIR** in the AUTOEXEC.BAT file.
4. The directory will now be automatically displayed whenever you start MS-DOS*.

Command Piping

If you want to give more than one command to the system at a time, you can “pipe” commands to MS-DOS. For example, you may occasionally need to have the output of one program sent as the input to another program. A typical case would be a program that produces output in columns. It could be desirable to have this columnar output sorted.

Piping is done by separating commands with the pipe separator “|”. For example, the command

```
DIR |SORT
```

will give you an alphabetically sorted listing of your directory. The character “|” causes all output generated by the left side of this character to be sent to the right side of this character for processing.

Piping can also be used when you want to output to a file. If you want your directory sorted and sent to a new file (for example, DIREC.FIL), you could type:

```
DIR |SORT >DIREC.FIL
```

MS-DOS will create a file named DIREC.FIL on your default drive. DIREC.FIL contains a sorted listing of the directory on the default drive, since no other drive was specified in the command. To specify a drive other than the default drive, type:

```
DIR |SORT >B:DIREC.FIL
```

This sends the sorted data to a file named DIREC.FIL on drive B.

A pipeline may consist of more than two commands. For example,

```
DIR |SORT |MORE
```

will sort your directory, show it to you one screen at a time, and put — More — at the bottom of your screen when there is more output to be seen.

CONFIG.SYS File

In many cases, there are installation-specific settings for MS-DOS* that need to be configured at system startup. An example of this is a standard device driver, such as an online printer.

The MS-DOS* configuration file (CONFIG.SYS) allows you to configure your system with a minimum of effort. With this file, you can add device drivers to your system at startup. The configuration file is simply an ASCII file that has certain commands for MS-DOS* startup (boot). The boot process is as follows:

1. The diskette boot sector is read. This contains enough code to read MS-DOS* code and the installation's BIOS (machine-dependent code).
2. The MS-DOS* code and BIOS are read.
3. A variety of BIOS initializations are done.
4. A system initialization routine reads the configuration file (CONFIG.SYS), if it exists, to perform device installation and other user options. Its final task is to execute the command interpreter, which finishes the MS-DOS* boot process.

If there is not a CONFIG.SYS file on the MS-DOS diskette, you can use the MS-DOS* editor, EDLIN, or COPY command to create a file; then save it on the MS-DOS* diskette in your root directory.

The following is a list of commands for the configuration file CONFIG.SYS:

BUFFERS = <number>

This is the number of sector buffers that will comprise the system list. It is installation-dependent.

If not set, 2 is a reasonable number.

FILES = <number>

This is the number of open files that the operating system calls can access. It is installation-dependent.

If not set, 8 is a reasonable number.

DEVICE = <filename>

This installs the device driver in <filename> into the system list.

BREAK = <ON or OFF>

If ON is specified (the default is OFF), a check for Ctrl/C as input will be made every time the system is called. ON improves the ability to abort programs over previous versions of the MS-DOS*.

SHELL = <filename>

This begins execution of the shell (top-level command processor) from <filename>.

COUNTRY = <value>

This value allows MS-DOS to use international time, date, currency, and case conversion.

Value	Country	Date	Time
001	United States	mm-dd-yy	hh:mm:ss.cc
031	Netherlands	dd-mm-yy	hh:mm:ss.cc
032	Belgium	dd/mm/yy	hh:mm:ss.cc
033	France	dd/mm/yy	hh:mm:ss.cc
034	Spain	dd/mm/yy	hh:mm:ss.cc
039	Italy	dd/mm/yy	hh:mm:ss.cc
041	Switzerland	dd.mm.yy	hh.mm.ss.cc
044	United Kingdom	dd-mm-yy	hh:mm:ss.cc
045	Denmark	dd/mm/yy	hh.mm.ss.cc
046	Sweden	yy-mm-dd	hh.mm.ss.cc
047	Norway	dd/mm/yy	hh.mm.ss.cc
049	Germany	dd.mm.yy	hh.mm.ss.cc
061	Australia	dd-mm-yy	hh:mm:ss.cc
358	Finland	dd-mm-yy	hh:mm:ss.cc
972	Israel	dd/mm/yy	hh:mm:ss.cc

The default value is set at the United States (001).

**DRIVPARM = /d:<dd> [/C] [/f:<ff>] [/h:<hh>] [/n]
 [/s:<ss>] [/t:<ttt>]**

This command allows you to define parameters for block devices when you start MS-DOS*, overriding the original MS-DOS device driver settings. For details, see the optional MS-DOS* manual.

FCBS = <m>, <n>

This command allows you to determine the number of file control blocks that can be currently open. For details, see the optional MS-DOS* manual.

LASTDRIVE = <x>

This command sets the maximum number of drives you may access. <x> can be any letter from A to Z. The default value is E.

STACKS = <n>, <s>

This command is used to support the dynamic use of data stacks.

A typical configuration file might look like this:

```
Buffers = 10  
Files = 10  
Device = \ BIN \ NETWORK.SYS  
Break = ON  
Shell = A: \ BIN \ COMMAND.COM
```

Note here that the Buffers and Files parameters are set to 10. The system initialization routine will search for the filename \ BIN \ NETWORK.SYS to find the device that is being added to the system. This file is usually supplied on diskette with your device. Make sure that you save the device file in the pathname that you specify in the Device parameter.

This configuration file also sets the MS-DOS* command EXEC to the COMMAND.COM file located in the \BIN directory on diskette A.

RAM Drive

RAMDRIVE.SYS is a device driver that lets you use a portion of your computer's memory as if it were a disk drive. This memory area is called a RAM drive and is sometimes referred to as a virtual disk.

RAM drives are much faster than disk drives because the information they contain is always loaded into memory. If you have the optional CE-453B EMS memory card, you

can use this memory for one or more RAM drives. Otherwise RAMDRIVE.SYS locates RAM drives in low memory.

To install RAMDRIVE.SYS, include the following command in your CONFIG.SYS file:

```
DEVICE = RAMDRIVE.SYS [<bbbb>] [<ssss>] [<dddd>]  
[ /a]
```

The <bbbb> option specifies the disk size in kilobytes. The default is 64, and the minimum value is 16.

The <ssss> option specifies the sector size in bytes. The default value is 128. The values: 128, 256, 512, and 1024 are allowed.

The <dddd> option specifies the number of root directory entries. The default value is 64, the minimum value is 2, and the maximum value is 1024.

RAMDRIVE.SYS adjusts the value of <dddd> to the nearest sector boundary. For example, if you give a value of 25 when the sector size is 512 bytes, the 25 will be rounded up to 32. This is because 32 is the next multiple of 16 (there are sixteen 32-byte directory entries in 512 bytes).

The /a option lets you use the optional CE-453B EMS card for a RAM drive, if it has been installed.

Note: When you reset or turn off the power on your computer, the information stored in RAM drives is lost.

Internal Options

Overview

6-1

Battery Removal

6-3

**Color/Monochrome CRT
Adaptor**

6-7

Serial I/O Card

6-15

Overview

This chapter describes options that are installed as part of the internal hardware.

The first section describes how to remove the battery.

The second section describes how to install the CE-451A color/monochrome CRT adaptor.

The third section describes the CE-451B serial I/O card.

Battery Removal

Before installing various options, the battery installed in the computer must be removed to ensure safety.

This section describes how to remove the battery. For information about replacing the battery after installing options, see Chapter 2.

Before removing the battery, turn off power to the main unit and disconnect the AC adaptor cord and external devices connected to the main unit.

Next, disconnect the battery as described below.

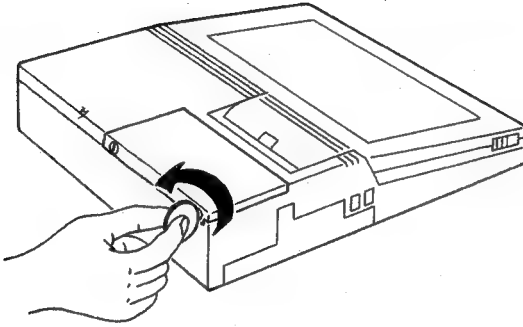
WARNING:

This equipment contains electrical circuits that can cause bodily injury. Never remove the battery cover unless the main unit is turned off and the AC adaptor cord disconnected.

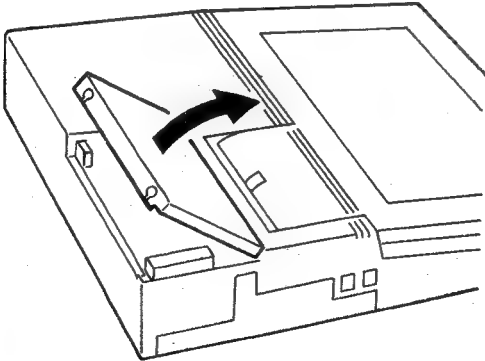
Close the unit and place face up as shown on the next page.

Next, using a coin, do the following:

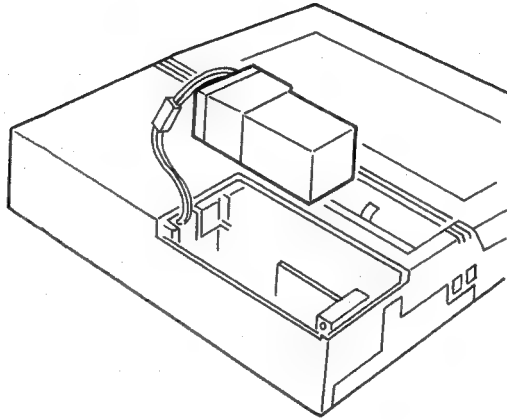
1. Unscrew, but do not remove, the two screws.



2. Remove the cover.



3. Take out the lead battery, and disconnect the battery connector.



This completes removing the battery. Turn to the next section or read the manual provided with the option for information on installing options.

After installing options, replace the battery as described in Chapter 2.

Turn power on to the main unit, and the set up menu appears on the screen. Set the date and time, and modify other fields if desired. Press **Set Up** and then **Enter**. The system is re-loaded and the internal checks are performed.

Color/ Monochrome CRT Adaptor

This section describes how to install the CE-451A color/monochrome CRT adaptor in the computer to enhance display capabilities. Once the adaptor is installed, a color CRT with specifications conforming to IBM* Color Display or a monochrome CRT with specifications shown on the next page can be connected to the system.

Note: Composite monitors and color televisions can not be used with your computer.

Specifications for connectable color CRT

Interface:	R(red), G(green), B(blue), and I(intensity), V-synch, H-synch, completely separate, TTL level interface.
Video signal	
Video amp bandwidth:	15.7 KHz to 15 MHz
Signal level:	2.4V (min) to 5.25V (max)
Signal polarity:	Positive
Horizontal synch signal	
Horizontal scan frequency:	15.7 KHz
Signal level:	2.4V (min) to 5.25V (max)
Signal polarity:	Positive
Vertical synch signal	
Vertical scan frequency:	60 Hz
Signal level:	2.4V (min) to 5.25V (max)
Signal polarity:	Positive
Scan method:	Non-interlaced
Interfacing connector:	9-pin D-SUB connector, male

Pin Number	Signal Name	Input/Output
1	Ground	
2	Ground	
3	Red	Output
4	Green	Output
5	Blue	Output
6	Intensity	Output
7	Not used	
8	Horizontal synch	Output
9	Vertical synch	Output

Specifications for connectable monochrome CRT

Interface: Video and I(intensity),
V-synch, H-synch, completely
separate, TTL level interface.

Video signal

Video amp bandwidth: 18.432 KHz to 16.27 MHz

Signal level: 2.4V (min) to 5.25V (max)

Signal polarity: Positive

Horizontal synch signal

Horizontal scan frequency: 18.432 KHz

Signal level: 2.4V (min) to 5.25V (max)

Signal polarity: Positive

Vertical synch signal

Vertical scan frequency: 50 Hz

Signal level: 2.4V (min) to 5.25V (max)

Signal polarity: Negative

Scan method: Non-interlaced

Interfacing connector: 9-pin D-SUB connector, male

Pin Number	Signal Name	Input/Output
1	Ground	
2	Ground	
3	Not used	
4	Not used	
5	Not used	
6	Intensity	Output
7	Video	Output
8	Horizontal synch	Output
9	Vertical synch	Output

Installation

The CE-451A color/monochrome CRT adaptor is installed inside the battery cover.

To begin, close down the system as if you were getting ready for travel. This includes turning off power and disconnecting the AC adaptor cord and external devices connected to the main unit.

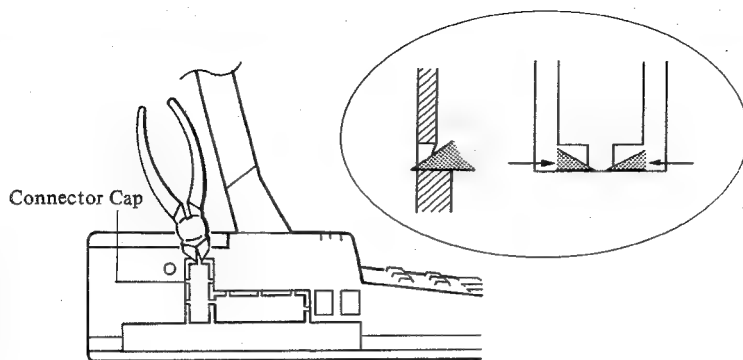
Next, remove the battery cover and battery as described in the first section of this chapter.

Then install the color/monochrome CRT adaptor as follows:

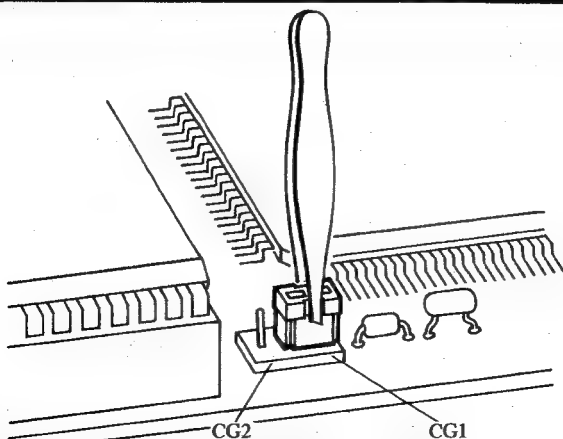
Note: The rubber tape supplied with the CE-451A is for the PC-4500 series and is not necessary for the PC-4600 series.

1. Remove the color/monochrome CRT connector cap from the main unit cabinet by using a nipper. Be careful not to leave any remains when cutting the connector cap.

Note: Be sure the direction of the edge of a nipper is correct.

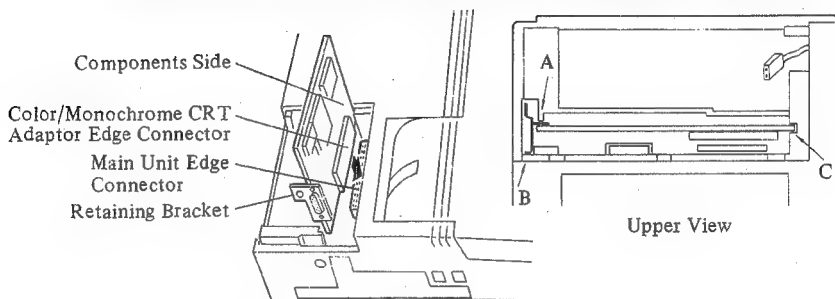


2. Before inserting the adaptor card, set the jumper plug according to the type of character set (CG1 or CG2). The original setting is for CG1. The character setting should remain at CG1 unless you are using the character set for Denmark/Norway. In that case, set the jumper switch to CG2.



3. Insert the edge connector of the color/monochrome CRT adaptor into the edge connector of the main unit. Be sure to insert the adaptor along the guides A, B and C referring to the illustration for upper view.

Note: The same procedure should be followed when installing the CE-452B or CE-453B in your computer.

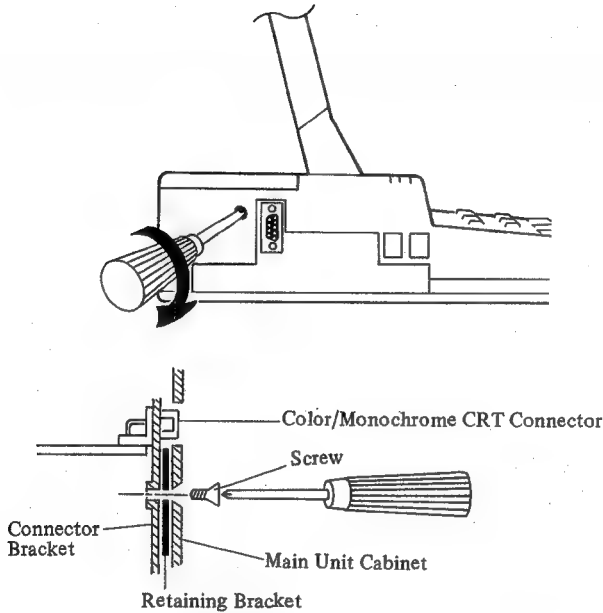


Note: When inserting the adaptor, do not pinch any connector cable.

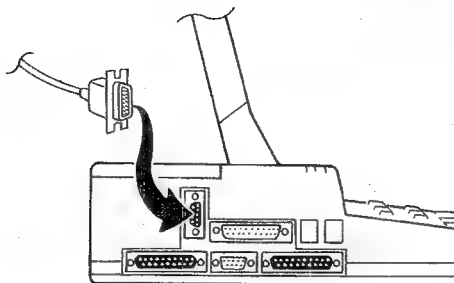
CAUTION:

The CE-451A color/monochrome CRT adaptor is very sensitive to static electricity. Be extremely careful when handling it. The bag containing the color/monochrome CRT adaptor protects it from static electricity. Keep the adaptor inside the bag until it is installed.

4. Secure the retaining bracket of the adaptor to the main unit by tightening one screw with a Phillips head screwdriver.



5. Connect the battery connector, and replace the battery.
6. Replace the battery cover, and tighten the two screws.
7. Connect the CRT to the main unit's color/monochrome CRT port on the rear panel with the CRT cable.



8. If the cable end has retaining screws, use them to fasten the cable to the main unit.

Set Up Functions

As described in Chapter 4, certain set up functions control the operation of the CE-451A CRT adaptor.

Once you have installed the CRT adaptor, it is necessary to modify the set up screen.

Since you removed the battery during the installation process, the set up screen appears just by turning power on to the computer.

SHARP PERSONAL COMPUTER SYSTEM SET-UP MENU (Version x.xx xx/xx/xx)		
----- Clock -----		
Time: 03:16:54		
Date: Sat March 21, 1987		
----- Power -----		
On Condition: None		
----- Display -----		
Display Mode:	Graphics	
Cursor Blink:	2/second	
Cursor Type:	Underline	
Character Blink:	1/second	
Background:	Standard	
Backlight:	On	
Backlight Timeout:	2 minutes	
----- Internal CRT Adapter -----		
Display Mode: Monochrome		
----- Communication -----		
COM1: Standard SIO		
COM2: Not Present		
----- Printer -----		
Interface: Parallel		
Port Address: 3BCH		
----- System -----		
Baud Rate: 1200		
Data Bits: 8		
Stop Bits: 1		
Parity: None		
Speed: Standard		
Key Click: Off		
Console: CGA		
Drive A: Internal 3.5"		
Font Set: General		
----- Hard Disk -----		
Motor Off: 2 minutes		
Default Setup: F1		
1. Position cursor using cursor keypad		
2. Press Spacebar to change		
3. Press Set Up key to Update and Exit		

Clock

The backup memory is lost once the battery is removed.
Re-enter the date and time.

Internal CRT Adaptor

This category appears when the optional CE-451A CRT adaptor is installed.

Display Mode. The display mode for the CRT adaptor is specified in this field. When connecting a color CRT, set to Color. When connecting a monochrome CRT, set to Monochrome. When the CRT display is not being used, select "OFF" to save power consumption of the main unit. The possible settings are: Monochrome, Color or OFF.

Note: Always set the CRT mode to "OFF" when you disconnect the CRT.

CAUTION:

Be sure the CRT display mode setting in the set up screen is appropriate. If the setting is wrong, the CRT may be damaged.

Device Indicator

When installing certain application software, you may be asked to identify the type of screen being used. When set to the color mode, the CE-451A color/monochrome CRT adaptor has the same functions as the IBM* color graphics adaptor except that the CE-451A has no composite video output. When set to the monochrome mode, the CE-451A has the same function as the IBM* monochrome adaptor except that the CE-451A has no parallel printer interface.

Serial I/O Card

This section provides a description of the CE-451B serial I/O (Input/Output) card designed to connect serial printer, external modem and mouse pointing devices to main unit.

By installing this card, you can use two serial ports (9-pin and 25-pin) on the computer.

To install the serial I/O card, contact the Sharp Service Center or an authorized Sharp dealer.

Set Up Functions

As described in Chapter 4, certain set up functions control the operation of the CE-451B serial I/O card.

Once you have installed the serial I/O card, these functions appear on the set up screen.

To access the set up screen, turn on the main unit, then press the **Set Up** key. The set up screen then displays as shown in the example below.

SHARP PERSONAL COMPUTER SYSTEM SET-UP MENU (Version x.xx xx/xx/xx)		
----- Clock -----		
Time: 03:16:54		
Date: Sat March 21, 1987		
----- Power -----		
On Condition: None		
----- Display -----		
Display Mode:	Graphics	
Cursor Blink:	2/second	
Cursor Type:	Underline	
Character Blink:	1/second	
Background:	Standard	
Backlight:	On	
Backlight Timeout:	2 minutes	
-----Communication-----		
COM1:	Standard SIO	
COM2:	Internal SIO	
-----COM1: Standard SIO-----		
Baud Rate:	1200	
Data Bits:	8	
Stop Bits:	1	
Parity:	None	
-----COM2: Internal SIO-----		
Baud Rate:	1200	
Data Bits:	8	
Stop Bits:	1	
Parity:	None	
----- Printer -----		
Interface:	Parallel	
Port Address:	3BCh	
----- System -----		
Speed:	Standard	
Key Click:	Off	
Console:	CCA	
Drive A:	Internal 3.5"	
Font Set:	General	
----- Hard Disk -----		
Motor Off:	2 minutes	
Default Setup: F1		
1. Position cursor using cursor keypad 2. Press Spacebar to change 3. Press Set Up key to Update and Exit		

Notice the setting for Internal SIO in the middle of the screen.

Also, notice the COM1 or COM2 setting is “Internal SIO”.

The following is a description of the internal SIO settings that control the CE-451B serial I/O card. (If you need instructions on moving around this screen and making changes, see Chapter 4.)

Baud Rate. The possible settings are: 110, 150, 300, 600, 1200, 2400, 4800, or 9600.

Data Bits. The possible settings are: 7 or 8.

Stop Bits. The possible settings are: 1 or 2.

Parity. The possible settings are: None, Even, or Odd.

External Floppy Disk Drive Unit

Overview

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Overview

This chapter describes how to use the CE-452F external 5-1/4 inch floppy disk drive unit with your computer.

The first section describes how to set up the CE-452F.

The second section describes how to use the CE-452F.

The third section describes 5-1/4 inch floppy diskettes.

Note: In some countries, the CE-452F may not be available.

Setting Up

Picking a Location

Begin setting up the CE-452F by picking a location for its use. While the CE-452F can fit in a very small area, certain guidelines should be followed so that it can be operated comfortably and safely.

Be sure the spot you pick to set up and run the CE-452F meets the following environmental requirements.

Surface. Pick a hard, flat surface on which to set up and operate the CE-452F. Using the CE-452F on a bed or rug restricts the air circulation and could result in static electricity affecting the performance of the system. A table or desk near the main unit is the best choice.

Temperature. Operate the CE-452F in temperatures between 10 degrees C (50 degrees F) and 35 degrees C (95 degrees F). Operating in extreme temperatures could damage the CE-452F.

Humidity. Operate the CE-452F in humidity levels under 80 percent. Excessive moisture can damage the CE-452F.

The following electrical requirements must be considered when picking a spot for the CE-452F.

Power Supply. The CE-452F runs on the AC current of local voltage. It must be plugged into a grounded outlet.

WARNING:

This equipment must be electrically grounded. It is equipped with a power cord that is plugged into a grounded outlet. You could severely damage the CE-452F if you fail to use an appropriately grounded outlet.

Interface Cable. The CE-452F comes with an interface cable to be connected to the computer.

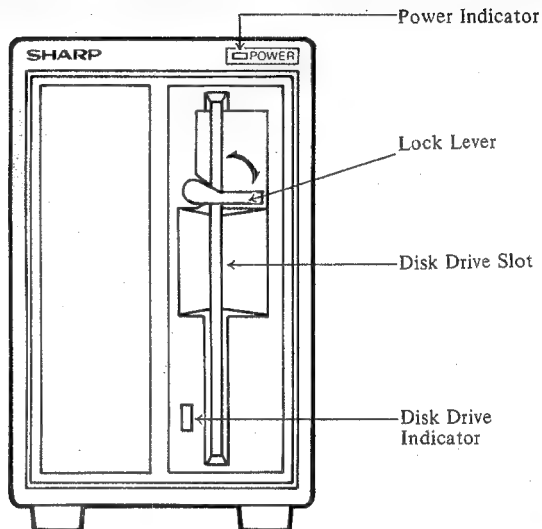
It is approximately 1 m (3-1/4 feet) long. Be sure you are within reach of the computer's left side panel when you pick a location.

Interference. It is possible that radio and television interference can occur when running the CE-452F, even if it is installed properly. Therefore, use the equipment away from radios and televisions.

If you suspect that the equipment is still causing interference, try plugging the equipment into an electrical circuit other than the one used for the radio and television.

Front Panel

The illustration below shows the front panel of the CE-452F floppy disk drive unit.



Disk Drive Slot. Insert a 5-1/4 inch floppy diskette into this slot.

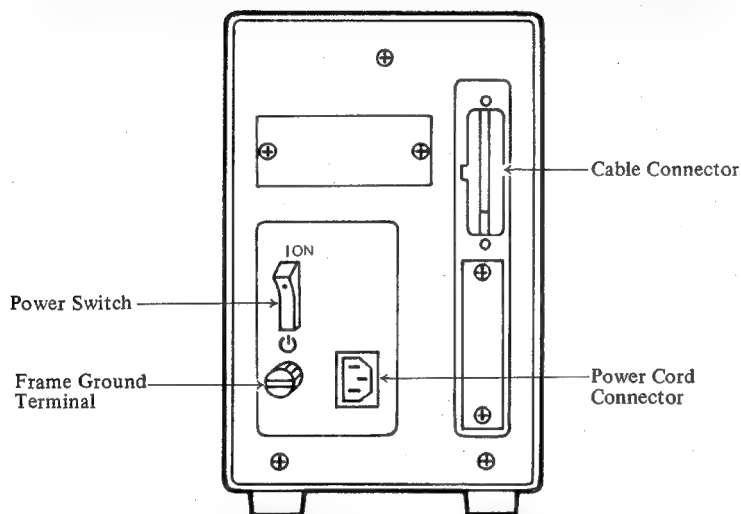
Lock Lever. Turn this lever horizontally to lock a diskette into the drive unit. To remove the diskette turn it back to the vertical position.

Disk Drive Indicator. To the lower left of the disk drive slot is a disk drive indicator. It illuminates when the system is accessing the external floppy disk drive unit.

Power Indicator. Located at the top of the front panel is the power indicator. When power is turned on to the CE-452F, this indicator illuminates.

Rear Panel

The illustration below shows the rear panel of the CE-452F.



Cable Connector. On the upper right of the rear panel is the cable connector, used to connect the interface cable.

Power Cord Connector. Connect the female end of the power cord to this connector and male end to the grounded wall outlet.

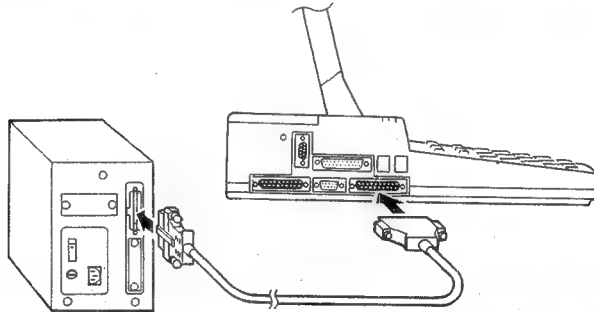
Power Switch. To turn on the CE-452F, press this switch to the "ON" position. To turn off the CE-452F, press the switch to the "⏻" position.

Frame Ground Terminal. If a ground is necessary, connect a ground wire to this terminal.

Setting Up

To set up the CE-452F external 5-1/4" floppy disk drive unit for operation, do the following:

1. Turn off power to the main unit.
2. Connect the male end of the interface cable to the floppy disk drive unit connector on the main units left side panel and the female end to the rear of the floppy disk drive unit. Use the screws to secure the cable to the main unit and floppy disk drive unit.

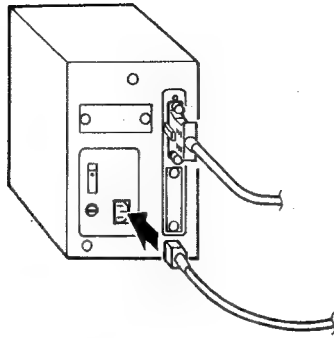


Note: Before connecting the cable, remove the dust cap from the floppy disk drive unit connector and save it for future use.

3. Connect the female end of the floppy disk drive power cord into the rear panel of the floppy disk drive unit and the male end to the grounded AC outlet.

CAUTION:

Before connecting the power cord, be sure that both the main unit and the floppy disk drive unit are turned off.



System All Reset

In order for the system to recognize the external floppy disk drive as drive C, you must reset the system using the dip switch on the computer's bottom panel. For details on dip switches, see Chapter 3. Once the external floppy disk drive is recognized, it is always considered to be connected and drive C is always reserved even if it is disconnected, until system all reset is executed with the external floppy disk drive disconnected.

Note: If your system has no dip switch on the bottom panel, reset the system by replacing the battery.

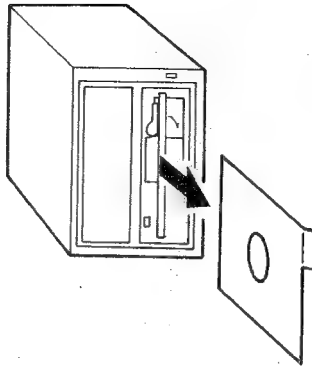
Remove Travel Insert

The travel insert is inserted in the floppy disk drive slot. It protects the disk heads from damage due to shock or vibration during transportation. Remove it before using the floppy disk drive unit.

To remove, do the following:

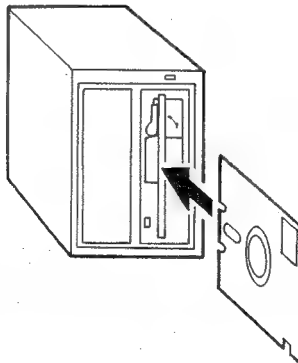
1. Turn the lock lever up to the vertical position.
2. Grasp the insert and remove from the drive slot.

Note: Be sure to save the insert. You will need to use it again whenever you transport the CE-452F.



Insert Diskette into Drive Unit

The illustration below shows how to insert a floppy diskette into a drive.



To insert a diskette, do the following:

1. Be sure the lock lever is turned to its vertical position.
2. Remove the diskette from its paper envelope.

3. Grasp the diskette by the top and insert into the drive slot so that the diskette label is facing the left.
4. Gently push the diskette into the slot until it comes to a stop.
5. Turn the lock lever to its horizontal position to lock the diskette in place.

Your CE-452F is now ready for operation. When using, turn on the CE-452F first, then the computer. When you finish working, turn off the computer first, then the CE-452F. If you power on or off in the wrong order, the floppy disk drive unit may not work properly.

Remove Diskette from Drive Unit

To remove a diskette, do the following:

1. Turn the lock lever to its vertical position.
2. Grasp the diskette and gently pull it out of the drive unit.
3. Place the diskette back into its paper envelope.

CAUTION:

Never attempt to remove a diskette from a disk drive when the disk drive indicator light on the CE-452F is illuminated. This may cause damage to the contents of the diskette.

Using the CE-452F

This section describes how to use the CE-452F external floppy disk drive unit with your computer.

Drive Designator

Usually, the external 5-1/4 inch floppy disk drive is assigned as drive C. If you have no diskette in drive A (and drive B), the system can be loaded from drive C. You can change the drive assignments A and C using the set up function described below.

Set Up Functions

If you want to change the drive assignment, a certain set up function setting needs to be made. First, turn on power to the CE-452F, then the computer. Then access the set up screen and locate the Drive A field in the System category.

SHARP PERSONAL COMPUTER SYSTEM SET-UP MENU (Version x.xx xx/xx/xx)			
----- Clock -----		-----Communication-----	
Time: 03:16:54		COM1: Standard SIO	
Date: Sat March 21, 1987		COM2: Not Present	
----- Power -----		----- Printer -----	
On Condition: None		Interface: Parallel	
		Port Address: 3BCh	
----- Display -----		-----System-----	
Display Mode: Graphics		Speed: Standard	
Cursor Blink: 2/second		Key Click: Off	
Cursor Type: Underline		Console: CGA	
Character Blink: 1/second		Drive A: Internal 3.5"	
Background: Standard		Font Set: General	
Backlight: On		----- Hard Disk -----	
Backlight Timeout: 2 minutes		Motor Off: 2 minutes	
		Default Setup: F1	
<p>1. Position cursor using cursor keypad 2. Press Spacebar to change 3. Press Set Up key to Update and Exit</p>			

Press **Space Bar** to change this field to "External 5.25" ". Then press **Set up** and then **Enter**. The computer will be re-started and load MS-DOS* from the CE-452F external floppy disk drive unit.

Note the internal 3-1/2 inch drive is assigned as drive C and the external 5-1/4 inch drive as drive A.

Transferring Data

Data can be transferred to or from the 5-1/4 inch floppy disk drive. When transferring data, however, do not use the DISKCOPY command. Instead, format the target diskette and then use the COPY command to transfer data.

To copy an entire diskette from 3-1/2 inch to 5-1/4 inch, the MS-DOS* command would be:

```
A>COPY *.* C:
```

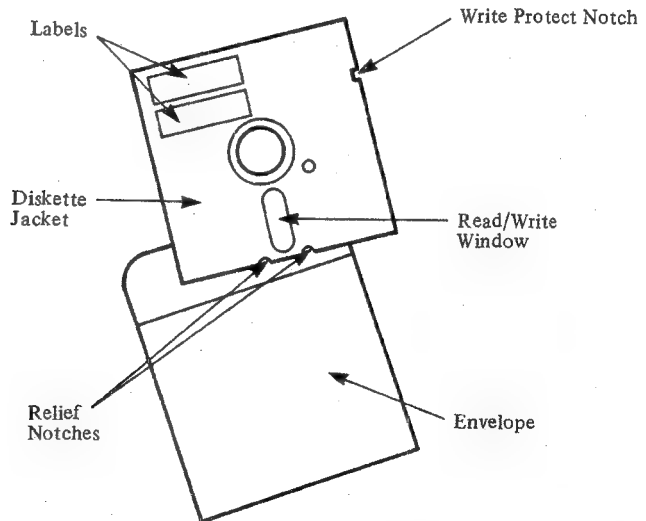

The Diskettes

The CE-452F uses 5-1/4 inch, double-sided, double density diskettes that store up to 360K of information.

Diskette Handling Procedures

To safeguard information stored on diskette, it is important that you handle diskettes with care.

The illustration below shows what a typical diskette looks like.



Envelope. The envelope protects the exposed areas of the diskette. Always return the diskette to its envelope after use.

Diskette Jacket. The diskette itself is permanently encased in a jacket to protect its magnetic surface. Never remove this jacket.

Label. The label identifies the content of the diskette. When you purchase blank diskettes, there is usually a place provided on the label for identifying the content of the diskette.

Read/Write Window. The read/write window allows the disk head to read from and write to the diskette. Never touch this area.

Write Protect Notch. When an adhesive tab (supplied with diskettes) is placed over this notch, the computer can not write information on the diskette. This insures that important files are not erased or written over. Most program diskettes come with this tab in place. You can also place the tab on your data diskettes to protect important files.

Relief Notches. The relief notches are designed to keep the diskette from bending when inserted into the disk drive unit.

Follow these procedures when handling diskettes:

- ▲ Never touch any exposed area of the diskette.
- ▲ Always return the diskette to its paper envelope after use.
- ▲ Never bend or twist the diskette.
- ▲ Never expose the diskette to liquids. If you spill a liquid on the diskette, throw the diskette away.
- ▲ Never expose diskettes to excessive heat or direct sunlight.
- ▲ Always keep diskettes at least 3 meters (10 feet) away from magnetic fields such as those in electronic equipment and telephones.
- ▲ Always store diskettes in a cool, dry, dust free area, in an upright position.
- ▲ Never place heavy objects such as books on the diskettes.
- ▲ When labelling your diskettes, always use a felt-tipped pen. Do not use a ballpoint pen or pencil.
- ▲ Always remove diskettes from the disk drive after use. Never leave diskettes partially inserted in a disk drive.

Appendices

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Overview

This chapter contains seven appendices covering a wide range of information.

The first appendix describes general maintenance activities you can perform to keep the system functioning at peak performance.

The second appendix describes how to diagnose problems on the computer including using the Diagnostic Program.

The third appendix is a GW-BASIC quick reference.

The fourth appendix shows a drive assignment table.

The fifth appendix is a troubleshooting chart to help you quickly solve problems.

The sixth appendix contains detailed specifications of the system including pin layout descriptions.

The seventh appendix is a glossary of terms used in this manual.

General Maintenance

There are certain general maintenance activities you can perform from time to time to keep your computer clean and operating at its utmost efficiency.

Preventative Maintenance

The computer is a sophisticated instrument containing many sensitive components. It should be handled with care. Here are some steps you can take to prevent damage to the system:

- ▲ Never expose the system to a harsh environment such as those containing rapid temperature changes or excessive dust.
- ▲ Never expose the system to excessive vibration.
- ▲ Prevent overheating by keeping the system's air vents clear of any obstructions. Never place anything on top of the system because this can also cause overheating.

CAUTION:

If there is any evidence of overheating (smoke, abnormal smell, etc.), immediately unplug the main unit's AC adaptor plug and contact your Sharp dealer.

- ▲ Do not use a power source where currents excessively fluctuate.

Dusting

It is important to keep the system free from dust. To dust the system, apply a small amount of dust remover to a dry, lint-free cloth. Rub the outside surfaces with the cloth, making especially certain that the air vents on the left side and rear panels are clear of dust.

Never use alcohol, benzine, thinner or other powerful substances that could damage the system's surface.

Cleaning Screen

The plastic screen may smudge or get dusty. To clean the screen's surface, gently rub it with a dry, lint-free cloth. Never use alcohol, benzine, thinner or other powerful substances, or a wet cloth to clean the screen's surface.

Notes: 1. Avoid touching the screen with your fingers when using the computer.

2. Do not spray cleaning fluid directly onto the casing or screen.

Battery Maintenance

To maintain the lead battery, observe the following requirements.

1. The battery charge may be lost due to self-discharge during transit.

Charge the battery for about 8 hours before use.

2. Whenever the low battery indicator lights during use, recharge the battery as soon as possible.
3. If you use the computer without recharging the battery after the low battery indicator lights, the computer is automatically turned off to prevent overdischarge of battery and to protect the computer hardware.

4. If the computer is stored for a long time, recharge the battery every 6 months so as to prevent deterioration due to self-discharge.

CAUTIONS:

1. Do not place the battery near excessive heat or fire.
Do not short-circuit the battery. The battery may burst if these conditions occur.
2. Do not disassemble the battery.
Whenever the battery casing is broken and its electrolyte contacts your skin or clothes, wash away with water. If electrolyte enters your eye, wash your eye with fresh water, and consult a doctor without delay.
3. To clean the battery, wipe it with dry cotton cloth.
Never use chemical fiber cloth.
4. Keep the battery from organic solvent, such as gasoline and thinner, and plasticizer for synthetic resins, oils, etc.

Diagnostics

This section describes procedures you can follow if you suspect that one of the components of your computer is malfunctioning.

Power-On Diagnostics

When the system's power is turned on, an automatic self-test routine is started. The system does the following:

1. When power is turned on, the following message displays on the screen:

```
The Sharp Personal Computer System
Firmware Version x.xx
Copyright (C) 1988 by Sharp Corporation
Copyright (c) 86, 87, 88 by Vadem Inc.

Processor      Passed.
Firmware ROM   Passed.
Keyboard       Passed.
Clock          Passed.
Setup RAM      Passed.
xxxK Memory.

Loading A:
```

2. After a few seconds, MS-DOS* is loaded, and the following displays:

```
The Sharp Personal Computer System
I/O Subsystem Version x.xx
Copyright (C) 1985, 1986, 1987, 1988 by Vadem Inc.
All Rights Reserved.

A>PATH \

A>VER

MS-DOS Version 3.30

A>
A>
```

If the system cannot load MS-DOS*, an error message appears. For example,

```
Loading A: ...  
Loading B: ..... Error!  
  
Diskette Drive Empty...  
Please Insert a System Disk and Press any key:_
```

Simply insert an MS-DOS* diskette in drive A and press any key.

If the power-on diagnostics routine does not function as described above, call your Sharp dealer.

Diagnostics Program

If the power-on diagnostic routine functions correctly, but you still suspect problems, use the diagnostic program on the MS-DOS* diskette.

The diagnostics program contains the following segments:

- ▲ Real Time Clock & Setup RAM
- ▲ Memory
- ▲ Keyboard
- ▲ Monochrome Adaptor
- ▲ Color Graphics Adaptor
- ▲ Liquid Crystal Display
- ▲ Floppy Disk Drive
- ▲ Printer
- ▲ Hard Disk Drive

Also the diagnostic program contains the hardware installation program to judge whether the reserved devices are attached to the main unit.

During these segments, text and graphics appear on the screen. If the program finds any problems, error messages are displayed. If an error message appears, call your Sharp dealer.

Diagnostic Program Start Up. To run the diagnostic program, insert the MS-DOS* diskette in drive A and turn on the power to the main unit. Then enter the command as shown below at the MS-DOS* prompt and press the Enter key.

```
A>DIAG
```

After several seconds, the diagnostic program is started and the following message appears on the screen:

```
DIAGNOSTIC PROGRAM   V-x.xx

1 --- Real Time Clock & Setup RAM
2 --- Memory
3 --- Keyboard
4 --- Monochrome Adaptor
5 --- Color/Graphics Adaptor
6 --- Liquid Crystal Display
7 --- Floppy Disk Drive
8 --- Printer
9 --- Hard Disk Drive
10 --- Run all above tests

0 --- Hardware Installation

Enter your selected number: _
```

Type the number of the item you want to test and press the Enter key.

Real Time Clock & Setup RAM. This section automatically checks the real time clock and setup RAM. This test checks if the clock works correctly, and reads/writes the data from/ to the battery backed-up memory for the set up function.

Memory. This section automatically begins a test of the main memory. If a memory error is detected, an error message displays.

Keyboard. This section is the keyboard test that begins with an image of the keyboard displaying on the screen. To test the performance of a key, simply press the key in question. A square should display on the keytop image for each key depressed.

Monochrome Adaptor. This section checks the monochrome display adaptor board. When this section is selected, the following appears on the screen:

Monochrome Adaptor Check

- 1 --- Monochrome display buffer check
- 2 --- Attribute check
- 3 --- Character set check
- 4 --- B/W mode check
- 5 --- Run all above checks

0 --- Exit

Enter your selected number: _

Note: When you select this test without setting the console on the set up screen to MDA, a warning message appears.

1. Monochrome Display Buffer Check

Checks the buffer in the monochrome adaptor.

2. Attribute Check

Displays the possible attributes in the monochrome mode: Normal, Intensity, Reverse, Blink, and Underline.

3. Character Set Check

Displays characters on the screen normally and then highlighted.

4. B/W Mode Check

Displays the black and white mode of the monochrome adaptor. Two patterns, all black and then all white, appear on the screen.

5. Run All Above Check

Checks all the items from 1 to 4 in sequence.

Press **0** to exit this section and return to the menu. If a defect is detected, call your Sharp dealer.

Color/Graphics Adaptor. This section checks the color/graphics adaptor. When this section is selected, the following appears on the display:

Color/Graphics Adaptor Check

- 1 --- Color/graphics display buffer check
- 2 --- Attribute check
- 3 --- 80x25 alphanumeric mode check
- 4 --- 40x25 alphanumeric mode check
- 5 --- 320x200 graphics mode check
- 6 --- 640x200 graphics mode check
- 7 --- Screen paging check
- 8 --- Color CRT check
- 9 --- Run all above checks

- 0 --- Exit

Enter your selected number: _

Note: When you select this test without setting the console on the set up screen to CGA, a warning message appears.

1. Color/Graphics Display Buffer Check
Checks the buffer in the color/graphics adaptor.
2. Attribute Check
Displays 16 colors for the characters, 8 colors for background, and also displays 8 colors in blink.
3. 80 x 25 Alphanumeric Mode Check
Displays characters on the screen normally and then highlighted in the 80 x 25 alphanumeric mode.
4. 40 x 25 Alphanumeric Mode Check
Displays characters on the screen normally and then highlighted in the 40 x 25 alphanumeric mode.

5. **320 x 200 Graphics Mode Check**
Displays two patterns of color graphics in the 320 x 200 graphics mode.
6. **640 x 200 Graphics Mode Check**
Displays a pattern of monochrome graphics in the 640 x 200 graphics mode.
7. **Screen Paging Check**
Displays the 8 pages of the color/graphics adaptor. Each page is filled with numbers from 0 to 7 corresponding to the page number and the number changes by pressing any key.
8. **Color CRT Check**
Displays each of the 16 colors painted on the entire screen one by one. The color changes by pressing any key.
9. **Run All Above Check**
Checks all the items from 1 to 8 in sequence.

Press **0** to exit this section and return to the menu.

If a defect is detected, call your Sharp dealer.

Liquid Crystal Display. This section checks the computer's standard screen.

When this section is selected, the following appears on the display:

Liquid Crystal Display Check

- 1 --- Checker pattern check
- 2 --- Striped pattern check
- 3 --- Run all above checks

- 0 --- Exit

Enter your selected number: _

1. Checker Pattern Check

Displays the checker pattern. A defect in any pattern indicates the faulty screen.

2. Striped Pattern Check

Displays the striped pattern. A defect in any pattern indicates the faulty screen.

3. Run All Above Check

Checks items 1 and 2 in sequence.

Press 0 to exit this section and return to the menu.

If a defect is detected, call your Sharp dealer.

Floppy Disk Drive. This section is a test to determine any defects in the read/write operation of your floppy disk drive.

CAUTION:

Data on the diskette in the drive you check may be erased during this section. Be sure the diskette to be tested contains no important files.

When this test is selected, the following appears on the display:

Floppy Disk Drive Check

- 1 --- Seek check
- 2 --- Write, read check
- 0 --- Exit

Enter your selected number: _

When a number is entered, the system asks you which drive to be tested. Insert a formatted diskette in the drive to be tested, type **A**, **B**, or **C** and then press **Enter**.

1. Seek Check

Checks if the read operation is performed correctly while increasing/decreasing the track counter.

2. Write, Read Check

Checks if the floppy disk drive read/write operation is performed correctly by comparing data written to the diskette with data read from the diskette. This test destroys all the data on the diskette.

If a problem is detected during the test, an error message displays.

Printer. This section tests the printer attached to the main unit. When this section is selected, the following appears on the display:

```
Printer Check  
1 --- Printer status check  
2 --- Character set check  
0 --- Exit  
Enter your selected number: _
```

When you select 1, the printer status is displayed on the screen. The following status categories are checked:

- ▲ Bsy — indicates if the printer is not busy
- ▲ Ack — indicates if the printer can communicate with the main unit
- ▲ Pe — indicates if paper is loaded into the printer
- ▲ Sel — indicates if the printer selection signal is on
- ▲ Ioe — indicates if the printer is free of mechanical problems
- ▲ Toe — indicates if the printer interface is functioning properly

In order to execute the character set check, an asterisk must appear below each category. Otherwise, an error message appears and the printer status appears on the screen. For example, if there is no asterisk under Pe, load paper into the printer. The asterisk should then display. If a true hardware malfunction is detected, you will not be able to obtain an asterisk in that category. Note the problem and contact your dealer.

Once all categories contain asterisks, press any key. The system returns to the menu shown above. Retry the character set check again. A test pattern is printed. If a problem is detected, an error message displays and the test is stopped.

Hard Disk Drive. This section is a test to determine any defects in the read/write operation of your hard disk drive.

CAUTION: Data on the hard disk drive may be destroyed.

When this section is selected, the following appears on the display:

```
Hard Disk Drive Check

1 --- Seek check
2 --- Write, read check

0 --- Exit

Enter your selected number: _
```

Be sure that the hard disk has no important files, type the number, and then press **Enter**. The system displays a warning message. Answer **Y** to the prompt.

1. Seek Check

Checks if the read operation is performed correctly while increasing/decreasing the cylinder counter.

2. Write, Read Check

Checks if the hard disk drive read/write operation is performed correctly by comparing data written to the hard disk with data read from the hard disk.

CAUTION: This test destroys all the data on the hard disk.

If a problem is detected during the test, an error message displays.

Run all above tests. When this item is selected, all the tests from 1 to 9 are performed sequentially.

Hardware Installation. When this item is selected, all the installed devices appear on the screen. The following are the names of possible devices:

Hardware Installation

System Board
Real Time Clock & Setup RAM
Main Memory (indicated by kilobytes)
EMS Memory Card
ROM Disk Card
Keyboard
Liquid Crystal Display
Monochrome CRT Adaptor
Color/Graphics CRT Adaptor
1, 2 or 3 Floppy Disk Drive(s) Adaptor
Printer Adaptor
Serial Port Adaptor
Co-processor
Hard Disk Drive (PC-4641 only)

If a device is connected to the main unit and it does not appear in the list, that device may be faulty.

GW-BASIC

Quick Reference

This appendix is the **GW-BASIC** quick reference. For details on each command, see the optional GW-BASIC Manual.

NAME	SYNTAX
ABS	ABS (X) Returns the absolute value of the expression X.
ASC	ASC (X\$) Returns a numerical value that is the ASCII code for the first character of the string X\$.
ATN	ATN (X) Returns the arctangent of X, where X is in radians.
AUTO	AUTO [(line number)] [, [(increment)]] Automatically generates line numbers during program entry.
BEEP	BEEP Sounds the speaker.
BLOAD	BLOAD (filename) [, (offset)] Loads a specified memory image file into memory from any input device.
BSAVE	BSAVE (filename), (offset), (length) Transfers the contents of the specified area of memory to any output device.
CALL	CALL (variable name) [(argument list)] Calls an assembly language subroutine or a compiled routine written in another high level language.

- CALLS** **CALLS** <variable name> [(<argument list>)]
Calls an assembly language subroutine or a compiled routine written in another high level language.
- CDBL** **CDBL** (X)
Converts X to a double precision number.
- CHAIN** **CHAIN** [MERGE] <filename> [, [(<line number exp>)] [, ALL] [, DELETE <range>]]
Calls a program and passes variables to it from the current program.
- CHDIR** **CHDIR** <path>
Changes the current directory.
- CHR\$** **CHR\$** (I)
Returns a string whose one character is ASCII character I.
- CINT** **CINT** (X)
Converts X to an integer by rounding the fractional portion.
- CIRCLE** **CIRCLE** [STEP] ((<x center> , <y center>) , <radius> [, <color>] [, <start> , <end>] [, <aspect>])
Draws an ellipse or circle with the specified center and radius.
- CLEAR** **CLEAR** [, [(<location>)] [, <stack>]]
Sets all numeric variables to zero, all string variables to null, and closes all open files.
- CLOSE** **CLOSE** [([#] <file number> [, [#] <file number...>]]
Concludes I/O to a file.
- CLS** **CLS** [0/1/2]
Erases contents of entire current screen.
- COLOR** **COLOR** [(<foreground>)] [, [(<background>)] [, <border>]]
 COLOR [(<background>)] [, [(<palette>)]
 COLOR [(<foreground>)] [, [(<background>)]
Allows you to select the foreground and background colors for the display.

COM	COM (n) [ON/OFF/STOP] Enables or disables event trapping of communications activity on the specified port.
COMMON	COMMON <list of variables> Passes variables to a chained program.
CONT	CONT Continues program execution after a Ctrl/C has been typed or a STOP statement has been executed.
COS	COS (X) Returns the cosine of X, where X is in radians.
CSNG	CSNG (X) Converts X to a single precision number.
CSRLIN	CSRLIN Obtains the current line position of the cursor in a numeric variable.
CVI	CVI (<2-byte string>) Converts string values to numeric values.
CVS	CVS (<4-byte string>) Converts string values to numeric values.
CVD	CVD (<8-byte string>) Converts string values to numeric values.
DATA	DATA <list of constants> Stores the numeric and string constants that are accessed by the program's READ statement.
DATES	DATES [= <string expression>] Sets or retrieves the current date.
DEF FN	DEF FN <name> [(<parameter list>)] = <function definition> Defines and names a function that is written by the user.
DEFINT	DEFINT <range(s) of letters> Declares variable types as integer.

- DEFSNG** **DEFSNG** <range(s) of letters>
Declares variable types as single precision.
- DEFDBL** **DEFDBL** <range(s) of letters>
Declares variable types as double precision.
- DEFSTR** **DEFSTR** <range(s) of letters>
Declares variable types as string.
- DEF SEG** **DEF SEG** [= <address>]
Assigns the current segment address to be referenced by a subsequent **BLOAD**, **BSAVE**, **CALL**, **CALLS**, or **POKE** statement or by a **USR** or **PEEK** function.
- DEF USR** **DEF USR** [<digit>] = <integer expression>
Specifies the starting address of an assembly language subroutine.
- DELETE** **DELETE** [(line number)] [-[(line number)]]
 DELETE -<line number>
 DELETE (line number)-
Deletes program lines.
- DIM** **DIM** <list of subscripted variables>
Specifies the maximum values for array variable subscripts and allocates storage accordingly.
- DRAW** **DRAW** <string expression>
Draws an object defined by the subcommands.
- EDIT** **EDIT** <line number>
Edits the specified line.
- END** **END**
Terminates program execution, closes all files, and returns to command level.
- ENVIRON** **ENVIRON** <string>
Modifies a parameter in MS-DOS's Environment String Table.
- ENVIRON\$** **ENVIRON\$** (<string parameter>)
 ENVIRON\$ (<n>)
Retrieves a parameter string from BASIC's Environment String Table.

EOF	EOF (<file number>)
	Tests for the end-of-file condition.
ERASE	ERASE <list of array variables>
	Eliminates arrays from memory.
ERDEV	ERDEV
	Provides a way to obtain device-specific status information.
ERDEV\$	ERDEV\$
	Provides a way to obtain device-specific status information.
ERL	ERL
	Returns an error code and line number associated with an error.
ERR	ERR
	Returns an error code and line number associated with an error.
ERROR	ERROR <integer expression>
	Simulates the occurrence of a BASIC error, or allows error codes to be defined by the user.
EXP	EXP (X)
	Returns e (base of natural logarithms) to the power of X.
EXTERR	EXTERR (n)
	Returns MS-DOS extended error information.
FIELD	FIELD [#] <file number>, <file width> AS <string variable>...
	Allocates space for variables in a random file buffer.
FILES	FILES [<filename>]
	Prints the names of files residing on the specified disk.
FIX	FIX (X)
	Returns the truncated integer part of X.

FOR...NEXT FOR <variable> = x To y [STEP z]

⋮

NEXT [<variable>] [, <variable>...]

Allows a series of instructions to be performed in a loop a given number of times.

FRE FRE (0)

Returns the number of bytes in memory that are not being used by GW-BASIC.

FRE (" ")

Forces a garbage collection before running the number of free bytes.

GET GET [#] <file number> [, <record number>]

Reads a record from a random disk file into a random file buffer.

GET (x1, y1) – (x2, y2), <array name>

Transfers the screen image bounded by the rectangle described by the specified points into the array.

GOSUB...RETURN

GOSUB <line number>

⋮

RETURN [<line number>]

Branches to, and returns from, a subroutine.

GOTO GOTO <line number>

Branches unconditionally to a specified line number.

HEX\$ HEX\$ (X)

Returns a string that represents the hexadecimal value of the decimal argument.

IF IF <expression> [,] THEN {(statement(s) |
<line number>)} [,] [ELSE {(statement(s) |
<line number>)}]]
IF <expression> [,] [THEN] GOTO
<line number> [,] [ELSE {(statement(s) |
<line number>)}]]

Makes a decision regarding program flow based on the result returned by an expression.

INKEY\$ INKEY\$

Returns either a one-character string containing a character read from the standard input device or a null string if no character is pending there.

INP INP (I)

Returns the byte read from port I.

INPUT INPUT [;] [“(prompt string)” {;|,}]
<list of variables>

Allows input from the keyboard during program execution.

INPUT# INPUT# <file number>, <variable list>

Reads data items from a sequential device or file, and assigns them to program variables.

INPUT\$ INPUT\$ (X [, [#] Y)

Returns a string of X characters read from file number Y.

INSTR INSTR ([I,] X\$, Y\$)

Searches for the first occurrence of string Y\$ in X\$, and returns the position at which the match is found.

INT INT (X)

Returns the largest integer $\leq X$.

IOCTL IOCTL [#] <file number>, <string>

Transmits a control character or string to a device driver.

- IOCTL\$** **IOCTL\$ ([#] <file number>)**
 Receives a control data string from a device driver.
- KEY** **KEY n, X\$**
 KEY LIST
 KEY ON
 KEY OFF
 Displays and modifies the values of function keys.
- KEY (n)** **KEY (n) {ON | OFF | STOP}**
 Controls interrupts generated by a function key.
- KILL** **KILL [<filename>]**
 Deletes a file or a pathname from disk.
- LEFT\$** **LEFT\$ (<string>, I)**
 Returns a string comprising the leftmost I characters of X\$.
- LEN** **LEN (<string>)**
 Returns the number of characters in <string>.
- LET** **[LET] <variable> = <expression>**
 Assigns the value of an expression to a variable.
- LINE** **LINE [[STEP] (x1, y1)] – [STEP] (x2, y2) [, [, <color>] [, B [F]]] [, <style>]]**
 Draws a line or box on the screen.
- LINE INPUT** **LINE INPUT [;] [“<prompt string>” ;]**
 <string variable>
 Inputs an entire line to a string variable, without the use of delimiters.
- LINE INPUT#** **LINE INPUT# <file number>,
 <string variable>**
 Reads an entire line, without delimiters, from a sequential disk data file to a string variable.

LIST LIST [(line number)] [-[(line number)]]
 [, (device)]

Lists all or part of the program currently in memory.

LLIST LLIST [(line number)] [-[(line number)]]

Lists all or part of the program currently in memory on the line printer.

LOAD LOAD (filename) [, R]

Loads a file from an input device into memory.

LOC LOC ((file number))

Returns the actual record number within the file or returns the current byte position in the file.

LOCATE LOCATE [row] [, [col] [, [cursor]
 [, [start] [, stop]]]]

Moves the cursor to the specified position.

LOCK...UNLOCK

LOCK [#] (file number) [, (record) |
 [(start)] TO (end)]

UNLOCK [#] (file number) [, (record) |
 [(start)] TO (end)]

Controls access by other processors to all or part of an opened file.

LOF LOF ((file number))

Returns the length of the named file in bytes.

LOG LOG (X)

Returns the natural logarithm of X.

LPOS LPOS (X)

Returns the current position of the printer's print head within the printer buffer.

LPRINT LPRINT [(list of expressions)]

Prints data on the printer.

LPRINT USING

LPRINT USING (string exp); (list of expressions)

Prints data on the printer.

LSET

LSET (string variable) = (string exp)

Moves data from memory to a random file buffer or left-justifies the value of a string into a string variable.

MERGE

MERGE (filename)

Merges a specified file saved in ASCII format into the program currently in memory.

MID\$

MID\$ ((string 1), n [, m]) = (string 2)

Replaces a portion of one string with another string.

MID\$ ((string), n [, m])

Returns a string of length m characters from (string), beginning with the n-th character.

MKDIR

MKDIR (path)

Creates a new directory.

MKI\$

MKI\$ ((integer expression))

Converts numeric values to string value.

MKS\$

MKS\$ ((single precision expression))

Converts numeric values to string value.

MKD\$

MKD\$ ((double precision expression))

Converts numeric values to string values.

NAME

NAME (old filename) AS (new filename)

Changes the name of a disk file.

NEW

NEW

Deletes the program currently in memory and clears all variables.

OCT\$

OCT\$ (X)

Returns a string that represents the octal value of the decimal argument.

ON COM

ON COM (n) GOSUB (line number)

Specifies the first line number of a subroutine to be performed when activity occurs on a communications port.

ON ERROR GOTO**ON ERROR GOTO** <line number>

Enables error handling and specifies the first line of the error handling routine.

ON...GOSUB **ON** <expression> **GOSUB** <list of line numbers>

Branches to one of several specified line numbers, depending on the value returned when an expression is evaluated.

ON...GOTO **ON** <expression> **GOTO** <list of line numbers>

Branches to one of several specified line numbers, depending on the value returned when an expression is evaluated.

ON KEY **ON KEY** (n) **GOSUB** <line number>

Specifies the first line number of a subroutine to be performed when a specified key is pressed.

ON PLAY **ON PLAY** (n) **GOSUB** <line number>

Branches to a specified subroutine when the music queue contains fewer than (n) notes.

ON TIMER **ON TIMER** (n) **GOSUB** <line number>

Provides an event trap during real time.

OPEN **OPEN** <filename> [**FOR** <model 1>] [**ACCESS** atype] [**!type**] **AS** [#] <file number> [**LEN** = <record length>] **OPEN** <mode 2>, [#] <file number>, <filename> [, <record length>]

Allows I/O to a file or device.

OPEN COM **OPEN** "COMn: [<speed>] [, [<parity>] [, [<data>] [, [<stop>] [, RS] [, CS [n]] [, DS [n]] [, CD [n]] [, BIN] [, ASC] [, LF]]]" [**FOR** <mode>] **AS** [#] <filename> [**LEN** = <record length>]

Opens and initializes a communications channel for input/output.

OPTION BASE**OPTION BASE n**

Declares the minimum value for array subscripts.

OUT OUT I, J

Sends a byte to a machine output port.

PAINT PAINT (X, Y) [, <paint> [, <bordercolor>] [, <background>]]

Fills a graphics area with the color or pattern specified.

PALETTE PALETTE [<attribute>, <color>]

Changes one or more of the colors in the palette.

PALLETTE USING**PALETTE USING <arrayname> <arrayindex>**

Changes one or more of the colors in the palette.

PCOPY PCOPY <sourcepage>, <destinationpage>

Copies one screen page to another in all screen modes.

PEEK PEEK (I)

Returns the byte read from the indicated memory location (I).

PLAY PLAY <string>

Plays music as specified by <string>.

PLAY (n)

Returns the number of notes currently in the background music queue.

PLAY ON PLAY ON

Enables play event trapping.

PLAY OFF PLAY OFF

Disables play event trapping.

PLAY STOP PLAY STOP

Suspends play event trapping.

- PMAP** PMAP <expression>, <function>
Maps world coordinate expressions to physical locations or maps physical expressions to a world coordinate location.
- POINT** POINT (<x coordinate>, <y coordinate>)
Allows the user to read the color number of a pixel from the screen.
 POINT (<function>)
Allows the user to retrieve the current graphics cursor coordinates.
- POKE** POKE I, J
Writes a byte into a memory location.
- POS** POS (I)
Returns the current horizontal (column) position of the cursor.
- PRESET** PRESET [STEP] (<x coordinate>, <y coordinate>) [, <color>]
Draws a specified point on the screen. PRESET works exactly like **PSET** except that if the <color> is not specified, the background color is selected.
- PRINT** PRINT [<list of expressions>]
Outputs data on the screen.
- PRINT USING** PRINT USING <string exp>; <list of expressions>
Prints strings or numbers using a specified format
- PRINT# and PRINT# USING**
 PRINT# <file number>, [USING <string exp>;] <list of expressions>
Writes data to a sequential file.
- PSET** PSET [STEP] (<x coordinate>, <y coordinate>) [, <color>]
Allows the <color> to be left off the command line.

PUT **PUT** [#] <file number> [, <record number>]

Writes a record from a random buffer to a random access file.

PUT **PUT** (x1, y1), <array name> [, action verb]

Transfers the image stored in the array onto the screen.

RANDOMIZE **RANDOMIZE** [<expression>]

Receeds the random number generator.

READ **READ** (list of variables)

Reads values from a **DATA** statement and assigns them to variables.

REM **REM** <remark>

Allows explanatory remarks to be inserted in a program.

RENUM **RENUM** [[<new number>] [, [<old number>]
[, <increment>]]]

Renumbers program lines.

RESET **RESET**

Closes all files.

RESTORE **RESTORE** [<line number>]

Allows **DATA** statements to be reread from a specified line.

RESUME **RESUME**

RESUME 0

RESUME NEXT

RESUME <line number>

Continues program execution after an error recovery procedure has been performed.

RIGHT\$ **RIGHT\$** (X\$, I)

Returns the rightmost I characters of string X\$.

RMDIR **RMDIR** <pathname>

Removes an existing directory.

RND **RND** [(x)]

Returns a random number between 0 and 1.

- RSET** **RSET** <string variable> = <string exp>
Moves data from memory to a random file buffer or right-justifies the value of a string into a string variable.
- RUN** **RUN** [<line number>
 RUN <filespec> [, R]
Executes the program currently in memory, or loads a file into memory and run it.
- SAVE** **SAVE** <filespec> [, {A | P}]
Saves a program file.
- SCREEN** **SCREEN** [<mode>] [, [<color mode>
 [, [<active page>] [, <visual page>]]]
Sets the specifications for the display screen.
- SCREEN** **SCREEN** (<row>, <column> [, z])
Reads a character or its color from a specified screen location.
- SGN** **SGN** (X)
Indicates the value of X, relative to zero.
- SHELL** **SHELL** [<command-string>
Exits the BASIC program, runs a **COM** or **EXE** or **BAT** program, or a built-in **DOS** function such as **DIR** or **TYPE**, and returns to the BASIC program at the line after the **SHELL** statement.
- SIN** **SIN** (X)
Returns the sine of X, where X is in radians.
- SOUND** **SOUND** <freq>, <duration>
Generates a sound through the speaker.
- SPACE\$** **SPACE\$** (I)
Returns a string of spaces of length I.
- SPC** **SPC** (n)
Skips spaces in a **PRINT** statement.
n is the number of spaces to be skipped.
- SQR** **SQR** (X)
Returns the square root of X.

STOP**STOP**

Terminates program execution and returns to command level.

STR\$**STR\$ (n)**

Returns a string representation of the value of n.

STRING\$**STRING\$ (I, J)****STRING\$ (I, X\$)**

Returns a string of length I whose characters all have ASCII code J or the first character of X\$.

SWAP**SWAP (variable), (variable)**

Exchanges the values of two variables.

SYSTEM**SYSTEM**

Closes all open files and returns control to the operating system.

TAB**TAB (I)**

Moves the print position to I.

TAN**TAN (X)**

Returns the tangent of X. (X should be given in radians.)

TIMES\$**TIMES\$ = (string expression)**

Sets the time. This statement complements the **TIMES\$** function, which retrieves the time.

TIMES**TIMES**

Retrieves the current time.

TIMER**TIMER**

Returns number of seconds having passed since midnight or system reset.

TIMER ON**TIMER ON**

Enables event trapping during real time.

TIMER OFF**TIMER OFF**

Disables event trapping during real time.

TIMER STOP**TIMER STOP**

Suspends real time event trapping.

TRON/TROFF**TRON****TROFF**

Traces the execution of program statements.

USR **USR** [<digit>] [<(argument)>]

Calls an assembly language subroutine.

VAL **VAL** (<string>)Returns the numeric value of string <string>.
The VAL function also strips leading blanks,
tabs, and linefeeds from the argument string.**VARPTR** 1 **VARPTR** (<variable name>)2 **VARPTR** (# <filename>)

- 1 Returns the address of the first byte of data identified with <variable name>.
- 2 For sequential files, returns the starting address of the disk I/O buffer assigned to <file number>.
For random files, returns the address of the **FIELD** buffer assigned to <file number>.

VARPTR\$ **VARPTR\$** (<variable name>)

Returns a character from the memory address of the variable in a form that is compatible for programs that may later be compiled.

VIEW **VIEW** [[**SCREEN**] [(Vx1, Vy1) – (Vx2, Vy2) [, [<color>] [, [<border>]]]]]

Defines screen limits for graphics activity.

VIEW PRINT **VIEW PRINT** [<top screen line> TO <bottom screen line>]

Sets the boundaries of the screen text window.

WAIT **WAIT** <port number>, I [, J]

Suspends program execution while monitoring the status of a machine input port.

WHILE...WEND

```
WHILE <expression>
:
[<loop statements>]
:
WEND
```

Executes a series of statements in a loop as long as a given condition is true.

WIDTH

```
WIDTH [LPRINT] <size>
WIDTH <file number>, <size>
WIDTH <device>, <size>
```

Sets the printed line width in number of characters for the screen or line printer.

WINDOW

```
WINDOW [[SCREEN] (Wx1, Wy1) –
(Wx2, Wy2)]
```

Defines the logical dimensions of the current viewpoint.

WRITE

```
WRITE [<list of expressions>]
```

Outputs data to the screen.

WRITE#

```
WRITE# <file number>, <list of expressions>
```

Writes data to a sequential file.

Drive Assignment

This appendix shows the drive assignment table. Since drive assignment changes according to the devices installed in or connected to the computer, be careful when specifying drive names in a MS-DOS command, etc.

MS-DOS Drive Assignment Table

Device	Floppy Unit	Drive Name				
		A:	B:	C:	D:	E:
1. Internal 3.5"	#0	*				
2. Internal 3.5"	#0	*				
Internal 3.5"	#1		*			
3. Internal 3.5"	#0	*				
External 5.25"	#2			*		
4. Internal 3.5"	#0	*				
Internal 3.5"	#1		*			
External 5.25"	#2			*		
5. Internal 3.5"	#0	*				
Internal HD	#0			*		
6. Internal 3.5"	#0	*				
External 5.25"	#2			*		
Internal HD	#0				*	
7. Internal 3.5"	#0	*				
ROM Disk	#1		*			
8. Internal 3.5"	#0	*				
Internal 3.5"	#1		*			
ROM Disk	#2			*		
9. Internal 3.5"	#0	*				
External 5.25"	#2			*		
ROM Disk	#3				*	
10. Internal 3.5"	#0	*				
Internal 3.5"	#1		*			
External 5.25"	#2			*		
ROM Disk	#3				*	
11. Internal 3.5"	#0	*				
ROM Disk	#1		*			
Internal HD	#0			*		
12. Internal 3.5"	#0	*				
External 5.25"	#2			*		
ROM Disk	#3				*	
Internal HD	#0					*

↑

This number represents the entry number which is used in the BIOS CALL.

Note: Once the external 5.25" floppy disk drive is recognized through the all reset procedure, the C drive is always assigned to the external 5.25" floppy disk drive even if it is disconnected. To cancel this setting, execute all reset with the external drive disconnected.

Troubleshooting

Below is a chart to help solve problems that might occur while running your computer. If you can't locate the problem you are experiencing on the system, call your Sharp dealer.

Problem	Suspect Area	Solution
No power to the main unit	Power switch button	Push on the power switch button
	Lead Battery	Charge with AC adaptor
	AC Adaptor	Plug one end into main unit and the other end into outlet. Be sure ends are plugged in all the way
	Faulty outlet	Plug power cord into a different outlet
	Faulty system	Call your Sharp dealer
Computer's screen is blank	Main unit power	Make sure AC adaptor plug is properly attached to main unit and plugged into an outlet – Make sure main unit is turned on
		Set dip switch 1 to ON and then OFF
	Faulty screen power supply	Call your Sharp dealer
Computer's screen is dim	Contrast control	Adjust the control
	Backlight auto-matic shut off	Press any key on the keyboard
	Backlight adjustment	Change the backlight setting on the set up screen
	Backlight degraded	Contact sharp dealer

Problem	Suspect Area	Solution
Unable to enter information at keyboard		Turn off main unit power, and turn power on again.
System unable to read floppy diskette	Disk drive is not locked	Insert diskette to the end
	Diskette inserted improperly	Re-insert diskette with the label side facing upward
	Bad diskette	Use another diskette
	Faulty disk drive	Contact Sharp dealer
No data printed by printer	Power	Be sure power cord is connected and power is turned on
	Online	Be sure printer is online
	Cable	Be sure printer cable is connected
	Supplies	Be sure you are using appropriate paper and ribbons
Nothing displays on the CRT	Power	Check that CRT power is turned on
	Brightness	Check that the CRT brightness control is adjusted appropriately
	Contrast	Check that the CRT contrast is adjusted appropriately
	Cable	Check that the CRT cable is connected
	CE-451A	Check that the CRT adaptor is installed properly
CE 451B serial I/O card does not function	Set up function	Check set up function See Chapter 6
	Cables	Check that SIO cable is connected to other equipment.
	CE-451B	Check that the serial I/O card is properly installed.

Problem	Suspect Area	Solution
CE-452F 5-1/4" floppy disk drive	Power	Check that disk drive power is turned on.
	Cable	Check that the 5-1/4" floppy disk drive cable is connected
	Disk drive is not locked	Turn the lock lever horizontally.
	Diskette inserted improperly	Re-insert diskette with the relief notch side first and the label side facing the left side of the disk drive
	Bad diskette	Use another diskette
	Faulty disk drive	Contact Sharp dealer

Specifications

The table below provides technical information about the components that make up the computer.

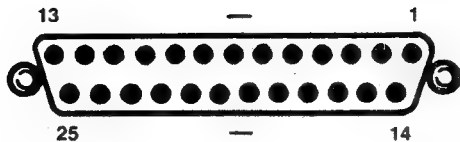
Item	Specification
Color/monochrome CRT adaptor card (optional)	Size: 60mm (W) x 134mm (H) (2-3/8" (W) x 5-3/8" (H)) Weight: Approx. 0.075 kg (0.17 lbs) Emulation: CGA/MDA mode selectable Interface: Direct connection to bus Main Unit Connector: 50-pin female connector Color CRT connector: 9-pin female connector
External 5-1/4" floppy disk drive (optional)	One 5-1/4 inch drive with the following: Capacity: 500K unformatted Size: 118mm (W) x 331mm (D) x 189mm (H) (4-3/4" (W) x 13" (D) x 7-1/2" (H)) Weight: Approx. 5.1 kg (11.3 lbs) Power source: 120V AC, 60 Hz Operating Temperature: 10 to 35 degrees C (50 to 95 degrees F) Storage Temperature: -20 to 60 degrees C (-4 to 140 degrees F) Operating Humidity: 20 to 80% Storage Humidity: 10 to 90%
External 5-1/4" floppy disk port	Interface: CE-452F 5-1/4" floppy disk drive unit exclusive-use
Hard disk drive (PC-4641 only)	3.5 inch hard disk with the following: Capacity: 40M bytes

Item	Specification
Internal floppy disk drive	3-1/2 inch with the following: Capacity: 1M unformatted
Keyboard	90 keystrokes including: 10 programmable function keys; 14 numeric keypad; 55 typewriter keys; 4 separated cursor keys; 4 control keys (Set Up, Esc, Ins, Del); 3 lock keys (NumLock, Scroll Lock, CapsLock)
Main unit	Size: 307mm (W) x 348mm (D) x 81mm (H) (12-1/8" (W) x 13-3/4" (D) x 3-1/4" (H)) Weight: (without AC adaptor) PC-4602: 4.9 kg (10.7 lbs) PC-4641: 5.45 kg (12.0 lbs) Power source: Lead battery, AC adaptor Operating temperature: 10 to 35 degrees C (50 to 95 degrees F) Storage temperature: -20 to 60 degrees C (-4 to 140 degrees F) Operating humidity: 20 to 80% Storage humidity: 10 to 90%
Parallel I/O port	Interface: Centronics Connector: 25 pin female, type D-shell
Processor (standard)	80188 compatible with 10 MHz clock
Processor (optional)	Socket for 8087-1 (10 MHz version)
RAM	640K
ROM	64K EP-ROM with IPL, BIOS, selfcheck, CG, and set up functions
Screen	Screen type: Super twist liquid crystal display View area: 25 lines by 80 characters Emulation: CGA, MDA, AT&T 640 x 400 Graphics: 640 by 400 pixels bit-mapped CGA double scan emulation with black and white 320 x 200 pixels with 4 color emulation (tyling) Character cell size: 8 by 16 dots

Item	Specification
Serial I/O card (optional)	<p>Size: 95mm (W) x 140mm (H) (3-3/4" (W) x 5-1/2" (H))</p> <p>Weight: Approx. 0.08 kg (0.18 lbs)</p> <p>Interface: RS-232C</p> <p>Transmission method: Asynchronous full or half duplex</p> <p>Baud rate: 110, 150, 300, 600, 1200, 2400, 4800, 9600</p> <p>Data length: 7 or 8 bits</p> <p>Parity check: None, even, or odd</p> <p>Stop bit: 1 or 2 bits</p> <p>Connector: 25-pin male, type D-shell</p>
Serial I/O port	<p>Interface: RS-232C</p> <p>Transmission method: Asynchronous full or half duplex</p> <p>Baud rate: 110, 150, 300, 600, 1200, 2400, 4800, 9600</p> <p>Data length: 7 or 8 bits</p> <p>Parity check: None, even, or odd</p> <p>Stop bit: 1 or 2 bits</p> <p>Connector: 9-pin male, type D-shell</p>

Pin Layout

Parallel Connector. The following is a pin location diagram for the parallel connector port on the computer:

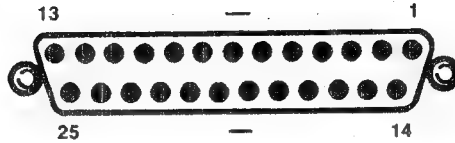


The following table describes the pins for the parallel connector:

Pin Number	Signal Name	Input/Output
1	Strobe	Output
2	Date 0	Output
3	Data 1	Output
4	Data 2	Output
5	Data 3	Output
6	Data 4	Output
7	Data 5	Output
8	Data 6	Output
9	Data 7	Output
10	Acknowledge	Input
11	Busy	Input
12	Paper-end	Input
13	Select	Input
14	Auto feed	Output
15	Printer error	Input
16	Initialize printer	Output
17	Select input	Output
18-25	Ground	

5-1/4" Floppy Disk Drive Unit Connector

The following is a pin location diagram for the 5-1/4" floppy disk connector port on the computer:

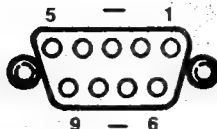


The following table describes the pins for the 5-1/4" floppy disk connector:

Pin Number	Signal Name	Input/Output
1		
2	IDX	Input
3	TK00	Input
4	WPT	Input
5	RD02	Input
6		
7		
8		
9	DS3	Output
10	DS2	Output
11	MON	Output
12	WDT2	Output
13	WTG2	Output
14		
15	HSL2	Output
16	DRTN2	Output
17	STP2	Output
18-25		

Serial Connector

The following is a pin location diagram for the RS-232C connector port on the computer:

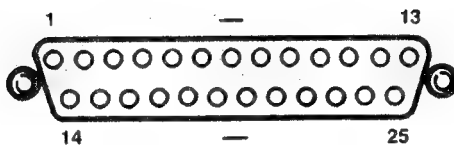


The following table describes the pins for the serial connector:

Pin Number	Signal Name	Input/Output
1	Carrier detect	Input
2	Receive data	Input
3	Send data	Output
4	Data terminal ready	Output
5	Signal ground	
6	Data-set-ready	Input
7	Request-to-send	Output
8	Clear-to-send	Input
9	Calling indicator	Input

Serial Connector (Option)

The following is a pin location diagram for the connector port on the CE-451B serial I/O card.

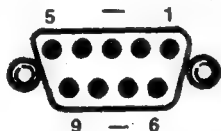


The following table describes the pins of the serial connector:

Pin Number	Signal Name	Input/Output
1	Frame ground	
2	Transmit data	Output
3	Receive data	Input
4	Request-to-send	Output
5	Clear-to-send	Input
6	Data-set-ready	Input
7	Signal ground	
8	Carrier detect	Input
20	Data terminal ready	Output
22	Calling indicator	Input

Color/Monochrome CRT Connector (Option)

The following is a pin location diagram for the CE-451A color/monochrome CRT adaptor connector port:



The following table describes the pins for the color/monochrome CRT connector:

In the color mode:

Pin Number	Signal Name	Input/Output
1	Ground	
2	Ground	
3	Red	Output
4	Green	Output
5	Blue	Output
6	Intensity	Output
7	Not used	
8	Horizontal synch	Output
9	Vertical synch	Output

In the monochrome mode:

Pin Number	Signal Name	Input/Output
1	Ground	
2	Ground	
3	Not used	
4	Not used	
5	Not used	
6	Intensity	Output
7	Video	Output
8	Horizontal synch	Output
9	Vertical synch	Output

Glossary

The following is a list of terms used in the Operation Manual.

application software: A series of inter-related programs designed to carry out a specific task such as word processing or graphics.

asynchronous: A mode of computer operation in which information is processed in a line or string preceded by a start bit and ended by stop bits.

baud rate: The transmission rate of information; typically used when describing data communications.

binary: A numbering system based on 1's and 0's widely used in computer processing.

bit: A binary digit; the smallest piece of information handled by computers.

byte: Unit in which data is processed; usually 8 bits.

card: An internal plug-in containing printed circuits and electrical components.

CPI: Characters per inch.

CPS: Characters per second.

CRT: Cathode ray tube; output device on which information is displayed.

data bits: Indicates length of a character (7 or 8 bits).

diskette: A flexible, magnetized, disk-shaped platter housed in a square jacket. It is inserted into a floppy disk drive to read/write information.

hardware: The equipment and components that comprise a computer system, i.e., keyboard, memory chips, printer.

I/O: Input/Output.

K: A symbol that represents capacity; i.e., 1K 1024 bytes.

modem: An acronym for MODulator DEModulator, the device is used primarily in sending and receiving data from one computer to another via telephone lines.

operating system software: Software that controls system resources such as memory, disk drives, processor, etc.

parallel I/O port: The connector point for external parallel devices, usually printers. Bits are transmitted simultaneously.

parity: A method of checking the accuracy of data.

RAM: Random Access Memory, a temporary storage space for information being worked on by the processor.

ROM: Read Only Memory, a permanent storage space for software.

serial I/O port: The connector point for external serial devices such as modems. Bits are transferred one by one.

spreadsheet application: Software that uses entries made into columns and rows to perform calculations.

software: Programs that contain coded instructions to direct a computer system to perform various operations.

stop bits: The number of bits that mark the end of a character.

word processing application: Software that is used to create and edit text documents.

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This apparatus complies with requirements of BS 800 and EEC directive 82/499/EEC.

Dieses Gerät stimmt mit den Bedingungen der EG-Richtlinien 82/499/EWG überein.

Cet appareil répond aux spécifications de la directive CEE 82/499/CEE.

Dit apparaat voldoet aan de vereiste EEG-reglementen 82/499/EEG.

Apparatet opfylder kravene i EF direktivet 82/499/EF.

Questo apparecchio è stato prodotto in conformità alle direttive CEE 82/499/CEE.

Αυτή η συσκευή τηρεί τις προδιαγραφές της EEC ντιρεκτίβα 82/499/EEC.

Este aparelho responde às especificações da directiva 82/499/CEE.

Este aparato cumple las especificaciones de la directriz de la CEE 82/499/CEE.